The PHOTOFACT Servicer

SET 437 ★ *Published for all users of Howard W. Sams' Photofact Folders* ★ APR 1, 1959

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This Servicer provides you with essential data on other models or special equipment not covered in standard PHOTOFACT folders. The schematics and supplementary data included here will be of valuable help to you in servicing this equipment.

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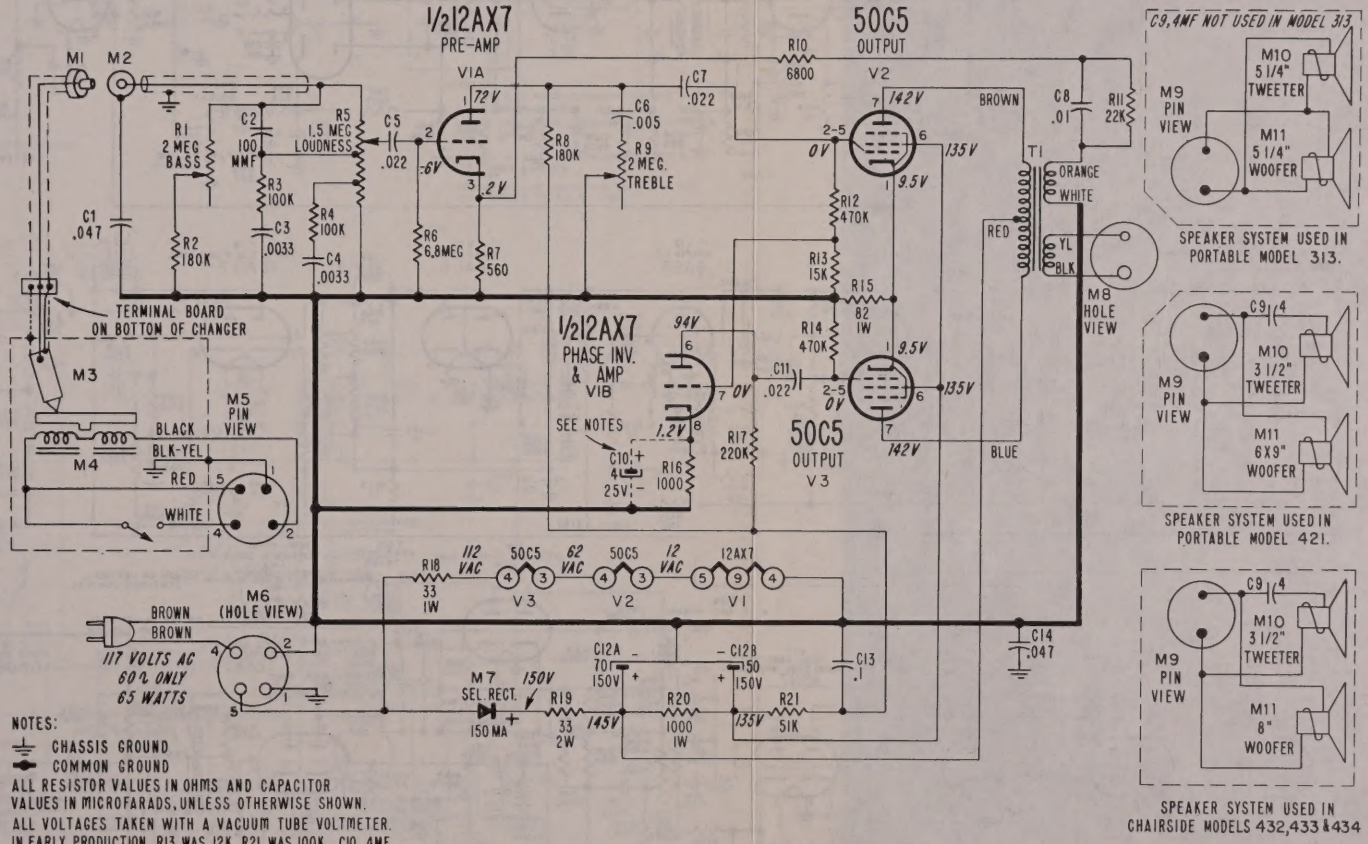
FADA
R1045



NOTES:

⏚ CHASSIS GROUND

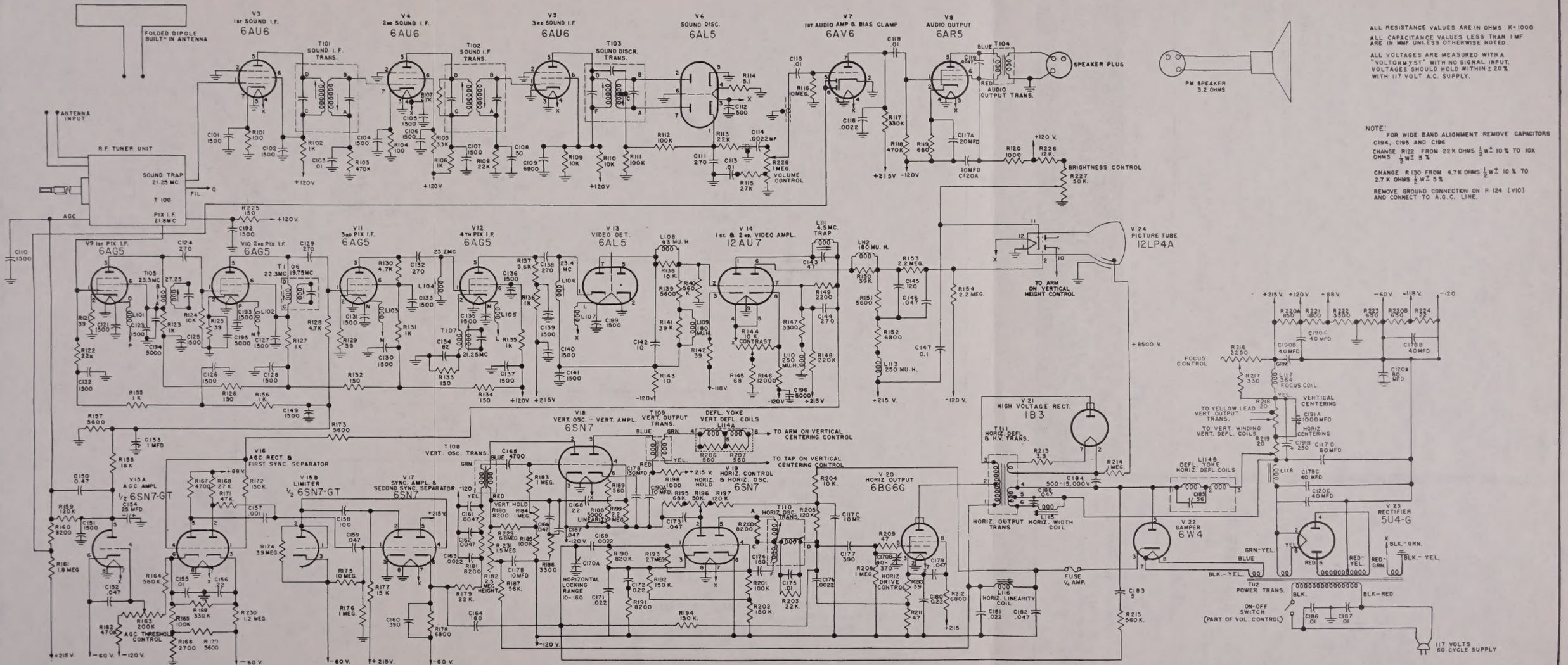
⏚ COMMON GROUND

ALL RESISTOR VALUES IN OHMS AND CAPACITOR VALUES IN MICROFARADS, UNLESS OTHERWISE SHOWN.

ALL VOLTAGES TAKEN WITH A VACUUM TUBE VOLTMETER. IN EARLY PRODUCTION, R13 WAS 12K, R21 WAS 100K. C10, 4MF, 25 VOLTS USED IN EARLY PRODUCTION ONLY. WHEN C10 WAS USED, R16 WAS 6800 Ω.

ADMIRAL MODELS 313, 421, 432, 433, 434 (Ch. 4N2A)

Schematic Diagram Courtesy of ADMIRAL CORPORATION


V3 1st SOUND I.F. 6AU6
V4 2nd SOUND I.F. 6AU6
V5 3rd SOUND I.F. 6AU6
V6 SOUND DISC. 6AL5
V7 1st AUDIO AMP & BIAS CLAMP 6AV6
V8 AUDIO OUTPUT 6AR5
FOLDED DIPOLE BUILT-IN ANTENNA
ANTENNA INPUT
R.F. TUNER UNIT
SOUND TRAP 21.25 MC
T 100
PIX I.F. 21.8MC
T101 SOUND I.F. TRANS.
T102 SOUND I.F. TRANS.
T103 SOUND DISCR. TRANS.
T104 AUDIO OUTPUT TRANS.
SPEAKER PLUG
PM SPEAKER 3.2 OHMS
BRIGHTNESS CONTROL R227 50K.
V9 1st PIX I.F. 6AG5
V10 2nd PIX I.F. 6AG5
V11 3rd PIX I.F. 6AG5
V12 4th PIX I.F. 6AG5
V13 VIDEO DET. 6AL5
V14 1st & 2nd VIDEO AMPL. 12AU7
V 24 PICTURE TUBE 12LP4A
TO ARM ON VERTICAL HEIGHT CONTROL
V15A AGC AMPL 1/2 6SN7-GT
V15B LIMITER 1/2 6SN7-GT
V16 AGC RECT. & FIRST SYNC. SEPARATOR
V17 SYNC. AMPL. & SECOND SYNC. SEPARATOR 6SN7
V18 VERT. OSC. - VERT. AMPL. 6SN7
V19 HORIZ. CONTROL & HORIZ. OSC. 6SN7
V 20 HORIZ OUTPUT 6BG6G
V 21 HIGH VOLTAGE RECT. 1B3
V 22 DAMPER 6W4
V 23 RECTIFIER 5U4-G
T108 VERT. OSC. TRANS.
T109 VERT. OUTPUT TRANS.
T110 HORIZ. OSC. TRANS.
T111 HORIZ. DEFL. & H.V. TRANS.
T112 POWER TRANS.
DEFL. YOKE VERT. DEFL. COILS L1148
TO ARM ON VERTICAL CENTERING CONTROL
TO TAP ON VERTICAL CENTERING CONTROL
HORIZ. OUTPUT TRANS
HORIZ. WIDTH COIL
HORIZ. LINEARITY COIL
HORIZ. DRIVE CONTROL
HORIZONTAL LOCKING RANGE 10-160
AGC THRESHOLD CONTROL
FUSE 1/4 AMP.
ON-OFF SWITCH (PART OF VOL. CONTROL)
117 VOLTS 60 CYCLE SUPPLY
FOCUS CONTROL
FOCUS COIL
VERTICAL CENTERING
HORIZ CENTERING
TO YELLOW LEAD VERT. OUTPUT TRANS.
TO VERT. WINDING VERT. DEFL. COILS
+8500 V.
+215 V.
+120 V.
-120 V.
-60 V.
-118 V.
ALL RESISTANCE VALUES ARE IN OHMS K=1000
ALL CAPACITANCE VALUES LESS THAN 1 MF ARE IN MMF UNLESS OTHERWISE NOTED.
ALL VOLTAGES ARE MEASURED WITH A "VOLTOHMYST" WITH NO SIGNAL INPUT. VOLTAGES SHOULD HOLD WITHIN ± 20% WITH 117 VOLT A.C. SUPPLY.
NOTE:
FOR WIDE BAND ALIGNMENT REMOVE CAPACITORS C194, C195 AND C196
CHANGE R122 FROM 22K OHMS 1/2 W ± 10% TO 10K OHMS 1/2 W ± 5%
CHANGE R130 FROM 4.7K OHMS 1/2 W ± 10% TO 2.7K OHMS 1/2 W ± 5%
REMOVE GROUND CONNECTION ON R 124 (V10) AND CONNECT TO A.G.C. LINE.

FADA MODEL R1045

Schematic Diagram Courtesy of FADA RADIO and ELECTRIC Co.

PHOTOFACT* Folder

*TRADE MARK

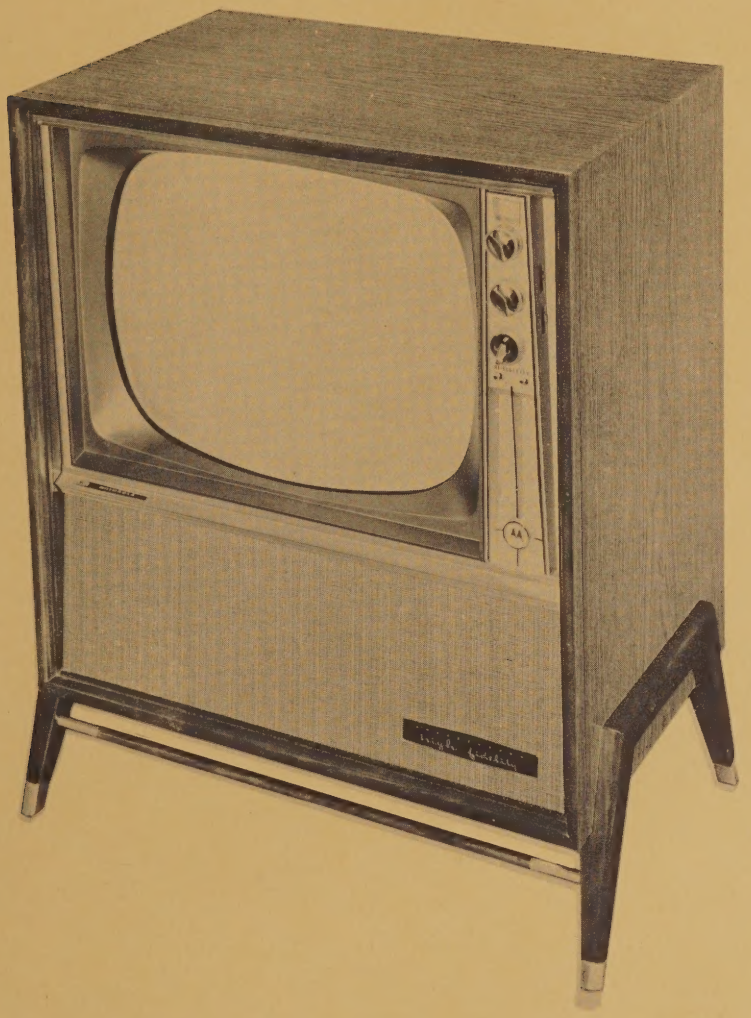
MOTOROLA MODELS 21K104B, M, W, 21K105B, MC, W, 21K108W, 21K109M, 21K110W, Y21K104B, M, W (Ch. TS-552, TS-552Y)

IMPORTANT FILING NOTICE

The TV Folder for this envelope will be found among the first folders in this complete Set of folders.

Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.

MOTOROLA MODELS 21K104B, M, W, 21K105B, MC, W, 21K108W, 21K109M, 21K110W, Y21K104B, M, W (Ch. TS-552, TS-552Y)



MODEL 21K104M (Ch. TS-552)

MOTOROLA MODELS 21K104B, M, W, 21K105B, MC, W, 21K108W, 21K109M, 21K110W, Y21K104B, M, W (Ch. TS-552, TS-552Y)

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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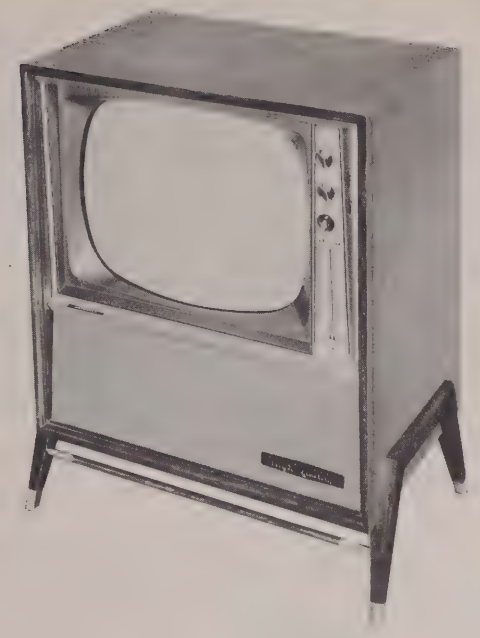
PHOTOFACT* Folder

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 5 push-on type knobs from the front and 1 from the rear.
2. Remove 2 metal screws holding stereo receptacle to the rear cover.
3. Remove 1 metal and 7 wood screws holding rear cover. Remove the rear cover.
4. Remove 3 plugs and ground strap from tuner bracket to chassis.
5. Remove speaker leads.
6. Remove 4 bottom chassis bolts.
7. Remove chassis from the rear.
8. Locate release lever for Brightness and Vertical controls located inside cabinet just to the right of these controls. Push lever upward to release.
9. Remove 2 bottom and 2 top metal screws holding control bracket to cabinet.
10. Remove tuner and control bracket from cabinet.



MODEL 21K104M (Ch. TS-552)

TRADE NAME	Motorola	MODELS	CHASSIS
		21K104B, M, W, 21K105B, MC, W, 21K108W, 21K109M, 21K110W	TS-552
		Y21K104B, M, W	TS-552Y
MANUFACTURER	Motorola, Inc., 4545 W. Augusta Blvd., Chicago 51, Illinois		
TYPE SET	Television Receiver		
TUBES	VHF - Twenty, UHF - Twenty-one		
POWER SUPPLY	110-120 Volts AC, 60 Cycle	RATING 235 Watts, 2.1 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustment of the VHF Oscillator is possible by removing the Channel Selector and Fine Tuning knobs. Set the Fine Tuning at the center of its range. The adjustments (located in a circle around the shaft) should be made in sequence from the highest to the lowest channel in the area. Channel 13 adjustment is located at 9 o'clock, proceed in a counterclockwise direction adjusting for best picture and sound.

SAFETY GLASS REMOVAL

Remove 5 wood screws holding safety glass metal trim at the top. Tilt out at top and lift to remove.

AGC

No provision is made to vary the AGC on this receiver.

FOCUS

The focus may be varied by the position of a strap on the base of the picture tube. The strap can be connected between pins 6 and 10, or 6 and 1.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENTS

For adjustment of the Horizontal Multivibrator, it is necessary to remove the rear cover and supply power to set. Set the Horizontal Hold at the center of its range and adjust the Horizontal Frequency slug (B1) until the picture synchronizes horizontally. (For location, see tube placement chart.)

FUSE

Two fuses are used. One is for low voltage power supply protection and one for video and sweep circuit protection. A fuse wire is used for filament protection.

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube. Rotate the two rings around the neck of the tube until the picture is properly centered.

ANTI-PIN CUSHION CORRECTION

Reduce the picture size so that the sides of the raster are visible. Position the 2 magnets so that all sides are straight.

MOTOROLA MODELS 21K104B, M, W, 21K105B, MC, W, 21K108W, 21K109M, 21K110W, Y21K104B, M, W (Ch. TS-552, TS-552Y)

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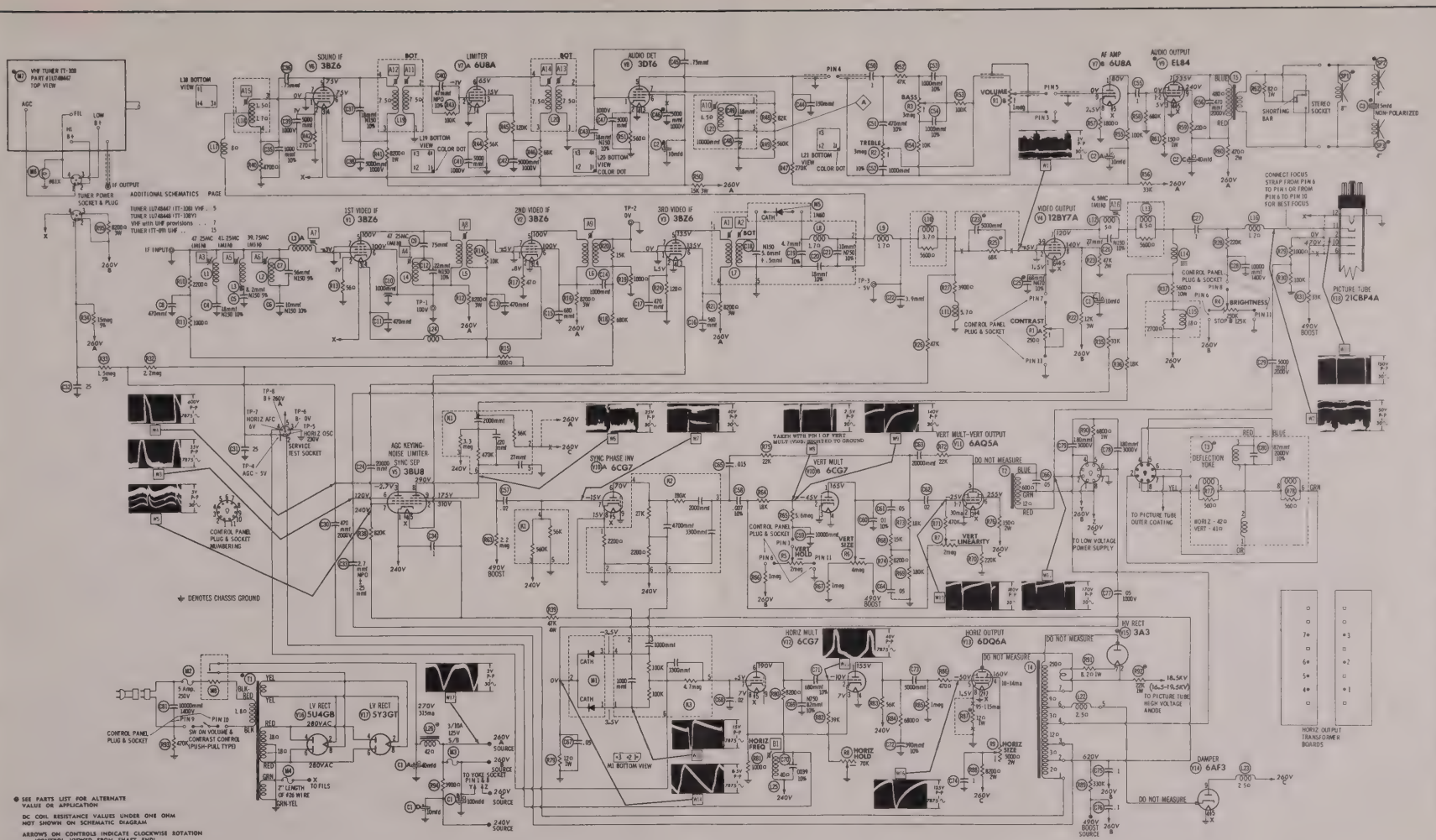

● SEE PARTS LIST FOR ALTERNATE VALUE ON APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

WAVEFORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE.

1. DC voltage measurements taken with vacuum tube voltmeter, AC voltage measured at 1000 ohms per volt
2. Pin numbers are counted in clockwise direction on bottom of socket
3. Measured values are from socket pin to common negative unless otherwise stated
4. Line Voltage maintained at 117 volts for voltage readings
5. All controls set for normal operation, no signal applied

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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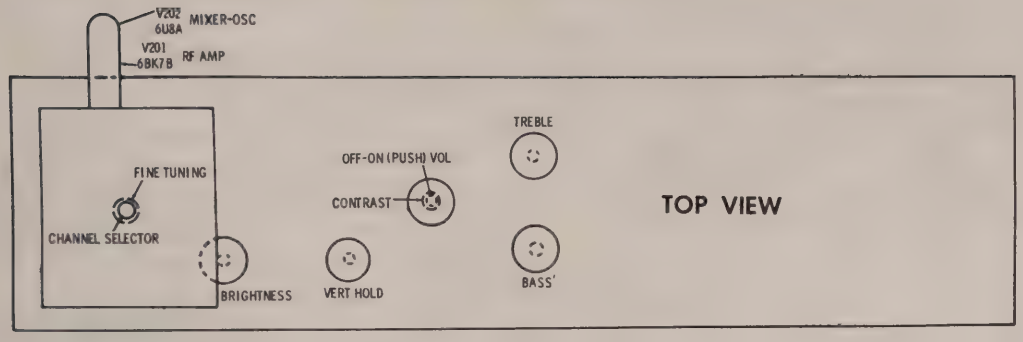
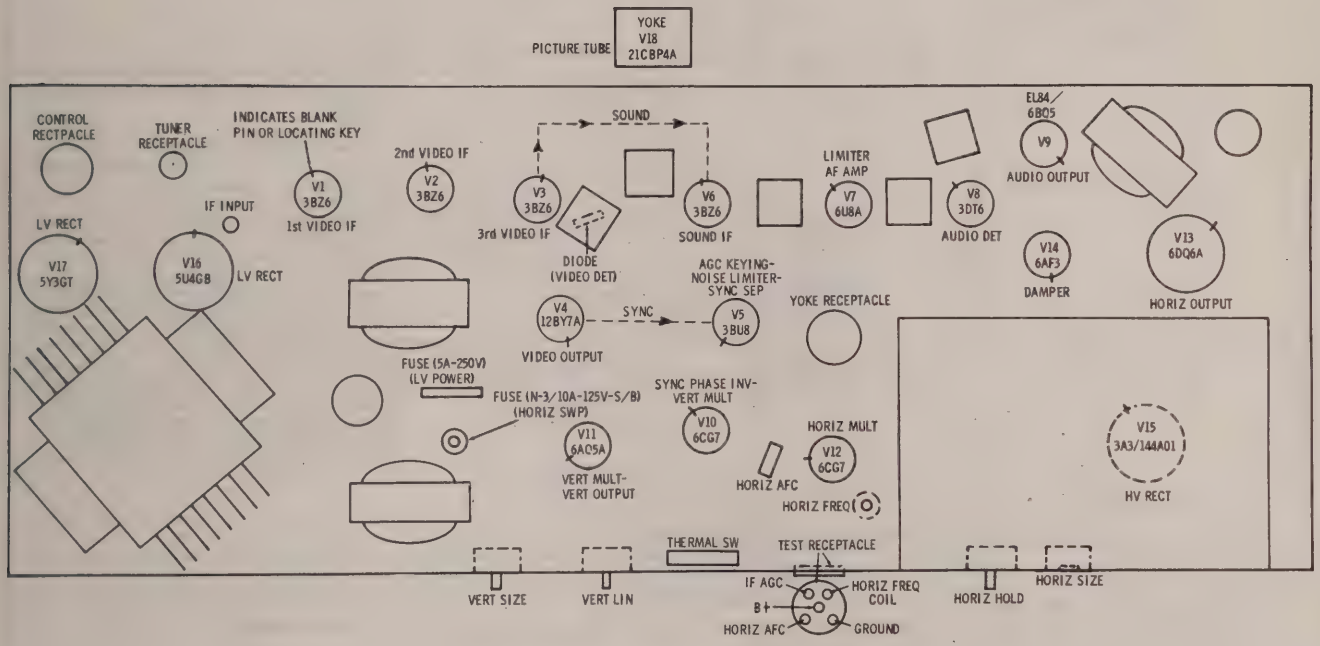
MOTOROLA MODELS 21K104B, M, W, 21K105B, MC, W, 21K108W, 21K109M, 21K110W, Y21K104B, M, W (Ch. TS-552, TS-552Y)

TUBE PLACEMENT CHART





TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce indicated symptoms. Refer to tube placement chart for location and type of tube.

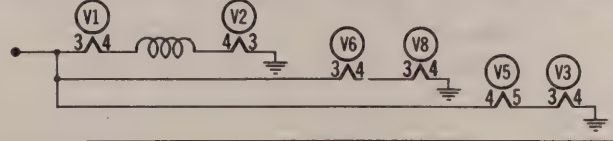
POWER SUPPLY FAILURE
No raster, no sound Fuse (5A), V16, V17, Fuse Wire (F1)

SWEEP FAILURE
No raster, has sound Rectifier (Horiz. AFC), V12, V13, Fuse (3/10A),
No vertical deflection V10, V11 V14, V15, V18
Poor vert. linearity or foldover V10, V11
Poor horiz. linearity or foldover V12, V13, V14
Narrow picture V12, V13, V14, V16, V17
Vert. off freq. V10, V11
Horiz. off freq. V12

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster V1, V2, V3, V5, Diode (Video Det)
No pic, no sound, has snow V201, V202, V1
No pic, has sound, has raster V4, V18
Has pic, no sound V6, V7, V8, V9
Overloaded picture V5

SYNC FAILURE
No vert. sync V5, V10
No horiz. sync V5, V10, Rectifier (Horiz. AFC)
No vert. or horiz. sync V5, V10

NOTE: Six tubes are used in series parallel arrangement. Tube failure in one circuit may cause failure in some other.



ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

The high voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.
Suggested Alignment Tools: GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545

VIDEO IF ALIGNMENT

Remove the deflection yoke plug to eliminate RF interference from the horizontal sweep circuit. Connect a 1500Ω 50 watt resistor from TP-8 to TP-6. CAUTION: TP-8 has B+ voltage on it.
Disable the tuner oscillator by shorting the Mixer Grid (V202) to chassis.
Set the Contrast fully counterclockwise.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Maintain between 2 and 5 volts peak to peak on the scope, except where otherwise noted in the procedure.
Connect the negative lead of a 6 volt bias supply to TP-4. Positive to chassis.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001mfd	High side to TP-2. Low side to chassis.	44.0MC (10MC Swp)	41.25MC 45.75MC	13	Vert. Amp. thru 47K to TP-3. Low side to chassis. (Across Video Det. load)	A1, A2	Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown. Peak with maximum core separation.
2.	Direct	Place a thin insulated metal strip between the Mixer-Osc. tube (V202), and tube shield. Connect the high side of sweep generator to the metal strip. Low side to chassis.	"	47.25MC	"	"	A3, A4	Reduce bias for steps 2, 3 and 4, if necessary. Adjust to place marker in trap notch as in Fig. 2. Tune slug at end of coil away from chassis.
3.	"	"	"	41.25MC	"	"	A5	Adjust to place marker in trap notch as in Fig. 2. Tune slug at end of coil nearest chassis.
4.	"	"	"	39.75MC	"	"	A6	Adjust to place marker in trap notch as in Fig. 2. Tune slug at end of coil away from chassis.
5.	"	"	"	39.75MC 41.25MC 42.25MC 44.0MC 45.75MC 47.25MC	"	Vert. Amp. to TP-1. Low side to chassis.	Mixer Plate Coil, & A7	Restore bias to 6 volts. Adjust for maximum gain and symmetry of response similar to Fig. 3 with markers as shown. The Mixer Plate Coil affects the center peak and A7 affects the two outside peaks. Tune slugs at end of coils away from chassis. If a suckout (trap effect) occurs, detune A8.
6.	"	"	"	42.25MC 45.75MC	"	Vert. Amp. thru 47K to TP-3. Low side to chassis. (Across Video Det. load)	A8, A9	Adjust A8 to place 42.25MC marker at 50% as in Fig. 4. Adjust A9 to place 45.75MC marker at 50% on other side. Tune slugs to end of coils nearest chassis. If necessary, retouch Mixer Plate Coil to correct tilt. Retouch A8 and A9 for correct response.

SOUND IF ALIGNMENT

Tune in a strong TV signal and adjust all controls for a normal picture and sound.
Connect the DC probe of a VTVM to point (A). Common to chassis. Adjust A10 for maximum deflection choosing the one of two peaks that produce the highest voltage. (CAUTION: This quadrature coil contains two slugs. The top preset core is set at the factory and should not be disturbed. If it should be misadjusted by previous service work, merely reset near the top of the coil and tune A10 for maximum deflection.)
As a fine adjustment of A10, adjust for maximum volume with MINIMUM distortion.
Change to a very weak signal (this may be done by loosely coupling the antenna lead to the antenna terminals of the receiver) that produces a hiss in the sound. Adjust A11, A12, A13, A14 and A15 for maximum sound with MINIMUM distortion.
If the sound is not clear at this time, repeat entire procedure.

4.5MC TRAP ALIGNMENT

Tune in a strong TV signal and turn Contrast fully clockwise.
Adjust the Fine Tuning until a strong 4.5MC beat pattern is visible.
Adjust A16 to find the two points at which the beat pattern is just noticeable. Tune the slug to the center of these two points. (Use the MINIMUM amount of inductance that will result in no apparent beat pattern.)

TUNER ALIGNMENT INSTRUCTIONS LOCATED ON PAGES 6 & 15

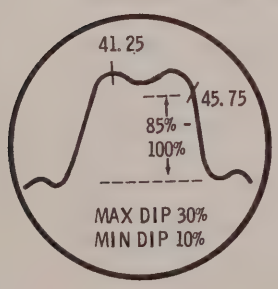


FIG.1

FIG.2

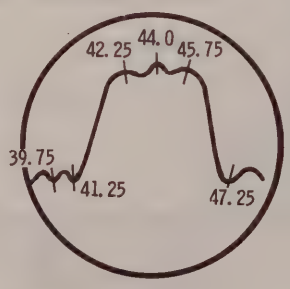


FIG.3

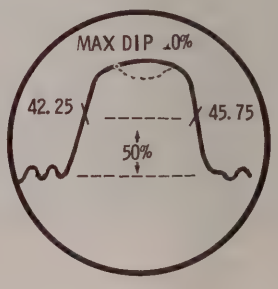
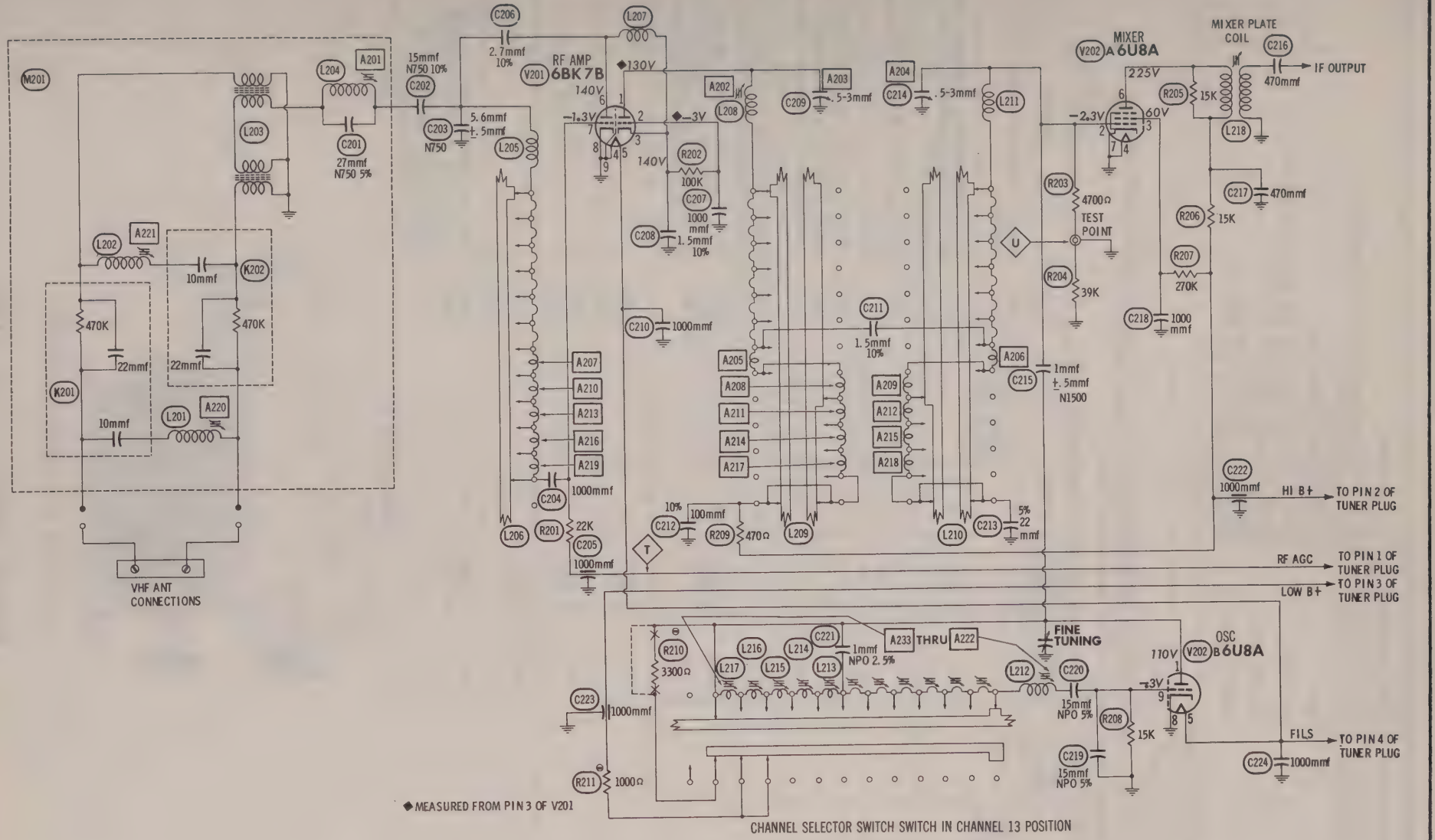


FIG.4



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VHF TUNER 1U748447 (TT-108)

MOTOROLA MODELS 21K104B, M, W, 21K105B, MC, W, 21K108W, 21K109M, 21K110W, Y21K104B, M, W (Ch. TS-552, TS-552Y)

TUNER ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS FOR TUNER TT108, TT108Y

The high voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.
Remove yoke plug to prevent interference radiation. Connect a 1500Ω 50 watt resistor from pin 1 of yoke socket to chassis.

Suggested Alignment Tools:

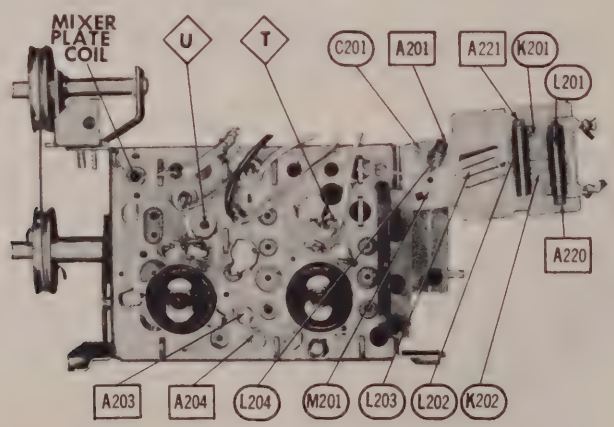
A201, A220, A221	GENERAL CEMENT #9296, 9297 WALSCO #2546, 2547
A202	GENERAL CEMENT #9050L, 9150 WALSCO #2521
A203, A204	GENERAL CEMENT #5000, 5003, 5014, 5015, 5016, 8276, 8290 WALSCO #2512, 2515, 2522, 2523, 2525, 2537
A222 thru A233	GENERAL CEMENT #8607, 9291 WALSCO #2520, 2522, 2523, 2524, 2537
Mixer Plate Coil	GENERAL CEMENT #8282, 8606, 8606L, 9091 WALSCO #2526, 2541, 2543, 2544

VHF RF AND MIXER ALIGNMENT

Connect a clip lead from point (T) to chassis.
Remove the tuner shield.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Two 120Ω Carbon Resistors	Across VHF antenna terminals with 120Ω in each lead.	94MC	94MC	6	Vert. Amp. thru 47K to point (U). Low side to chassis.	A201	Adjust for MINIMUM response at 94MC marker.
2.	"	"	213MC	211.25MC 215.75MC	13	"	A202	Preset A203 and A204 to mid-range. Adjust A202 for maximum gain and symmetry similar to Fig. 201.
3.	"	"	177MC	175.25MC 179.75MC	7	"	A203, A204	Adjust for maximum gain and symmetry of response similar to Fig. 201 with markers as shown.
4.	"	"	85MC	83.25MC 87.75MC	6	"	A205, A206, A207	Adjust in numerical order for response similar to Fig. 202. First two adjustments are for proper placement of markers. Third adjustment is for maximum gain and symmetry.
5.	"	"	"	"	"	"	A201	Adjust SLIGHTLY above point where is begins to affect response curve at sound marker.
6.	"	"	79MC	77.25MC 81.75MC	5	"	A208, A209, A210	Adjust in numerical order for response similar to Fig. 202. First two adjustments are for proper placement markers. Third adjustment is for maximum gain and symmetry.
7.	"	"	69MC	67.25MC 71.75MC	4	"	A211, A212, A213	"
8.	"	"	63MC	61.25MC 65.75MC	3	"	A214, A215, A216	"
9.	"	"	57MC	55.25MC 59.75MC	2	"	A217, A218, A219	"
10.	"	"	57MC	43.5MC 45.5MC	2	"	A220, A221	Adjust for A220 MINIMUM response at 43.5MC marker and A221 for MINIMUM response at 45.5MC marker. Retouch either or both for flat response with MINIMUM amplitude at marker.

CONTINUED PAGE 15



TUNER 10748447 —TOP VIEW

VHF TUNER with UHF provisions 1U748448 (TT-108Y)

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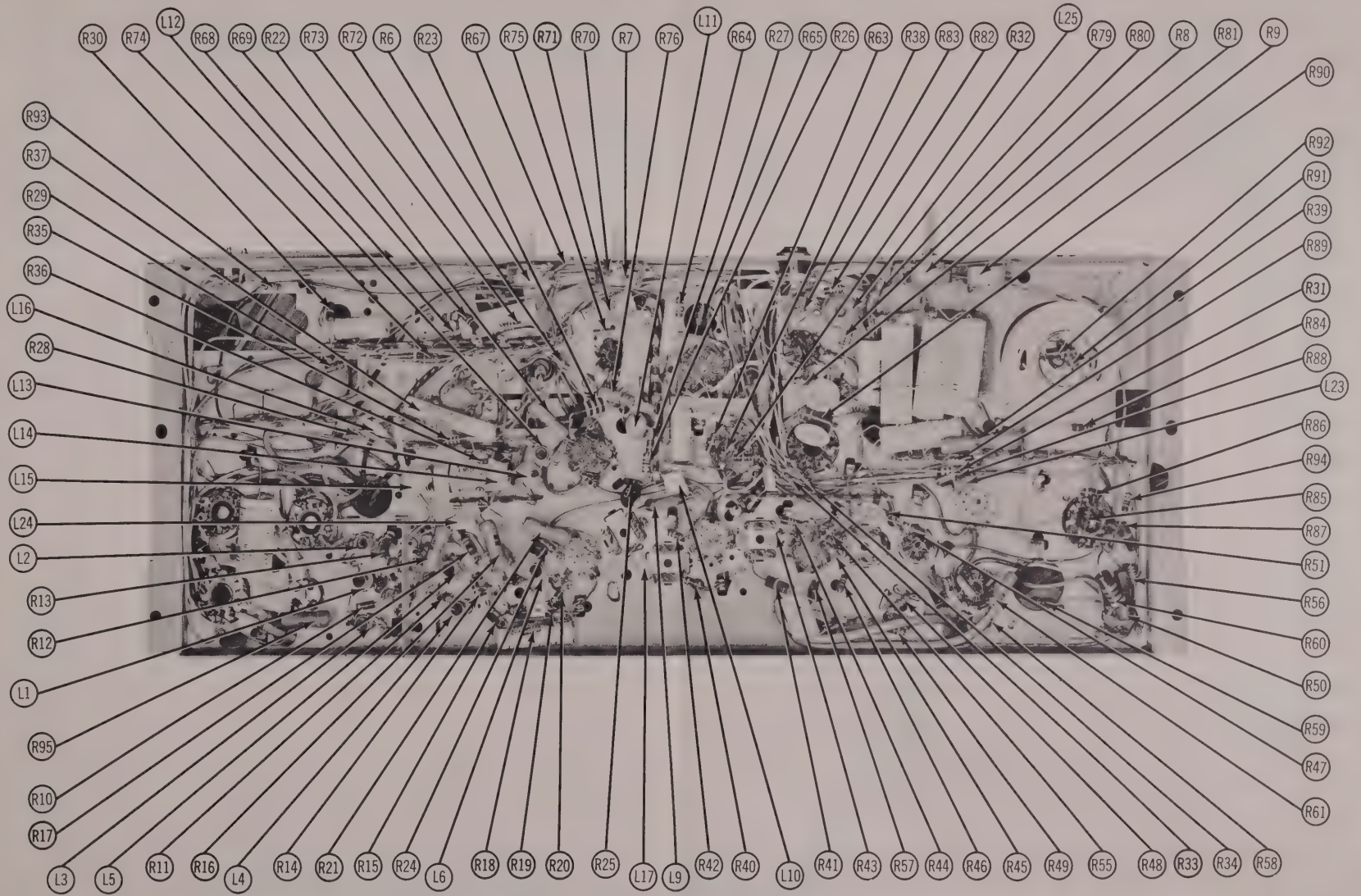


CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	1st Video IF Amp.	3BZ6	
V2	2nd Video IF Amp.	3BZ6	
V3	3rd Video IF Amp.	3BZ6	
V4	Video Output	12BY7A	
V5	AGC Keying - Noise Limiter - Sync Sep.	3BU8	
V6	Sound IF Amp.	3BZ6	
V7	Limiter - AF Amp.	6U8A	
V8	Audio Det.	3DT6	
V9	Audio Output	6L6A/ 6BQ6	

ITEM No.	USE	TYPE	NOTES
V10	Sync Phase Inv. - Vert. Mult.	6CG7	
V11	Vert. Mult. - Vert. Output	6AQ5A	
V12	Horiz. Mult.	6CG7	
V13	Horiz. Output	6DQ6A	
V14	Damper	6AF3	
V15	HV Rect.	3A3	3A3/ 144A01 *
V16	LV Rect.	5U4GB	
V17	LV Rect.	5Y3GT	

* Alternate.

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	MOTOROLA PART No.	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V18	21CBP4A	21BTP4 ①	21CBP4-A ②	21CBP4/ 21CBP4A ③	① "Aluminized", Add Ion Trap. ② "Silverama" ③ "Silver Screen 85"

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP	VOLT.	MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1A	40	400	23KT44120	AFH4-08	D0080	FP445	TMQ-8	TVL3-4681 *	
B	80	400			BR4045	TC80	TD-40-450		
C	10	400							
D	10	400							
C2A	10	400	23KT48365		B0370	FP231	TMD-47	TVL3-3693. 2*	
B	10	400			BR4045	TC78	TD-40-450		
C	40	400							
C3	5	10VAC	23A632350 ①	AC-PR80Y6	BBR10-25 † BBR10-25	TCM105	TD-10-25 † TD-10-25	TVA8-1110 *	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.
① Some versions may use a 5mfd ② 15VDC (Part #23C74S194).
† Connect negative leads together.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	18		N150 10%	21R120578						
C5	8.2		N150 5%	21R128940						
C6	10		N150 10%	21R120086						
C7	56		N150 5%	21R128699						
C8	470			21R114554	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C9	.75			21K735623						
C10	1000			21K737426	HF-001		MFT-1000		503C-DI	
C11	470			21R114554	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C12	22		N150 10%	21R130939						
C13	470			21R114554	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C14	1000			21R115386	BPD-001	DD-103	BYA10DLM	B-310	5HK-IX	
C15	680			21K747763	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C16	560			21K747762	BPD-00056	DD-561	BYA10T56	B-356	5GA-T56	
C17	470			21C746761	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C18	5.6		N150 s. 5mmf	21R128194						
C19	4.7		10%	21R115954	NPO-SI 4.7	TCZ-4R7	C10V47C	CNO-547	5TCC-C47S 10%*	
C20	18		10%	21R120578	DI 18	DD-180	L10Q18	CNO-418	5GA-Q4S 10% *	
C21	10		N750 10%	21R115114	N750-DI 10	DTN-10	C10Q1U	CN7-410	5TCU-Q1S 10% *	
C22	3.9			21R115953					5TCCH-V39S *	
C23	1000			21R115313	BPD-005	DD-502	BYA10D5	B-350	5HK-D6	①
C24	20000			21K741983	BPD-02	DD-203	BYB502	B-120	5GA-S2	
C25	68		N470 10%							②
C26	27		N150 10%	21R119996						
C27	.1	400		21R11005	P488N-1	DF-104	CUB4PI	GEM-401	4TM-P1	
C28	10000	1400		21R124553	DAC-27	DD16-103	HVE16S	XEV-110	20HK3-S1	
C29	5000	2000		21R120023		DD30-502	HVC20D6		20HK-D6	
C30	470	3000		21R121476	SVD-30-470	DD30-471	HVB20T47	XEV-347	20GA-T47	
C31	25	100		21K129245	P288N-25		CUB2P25	GEM-3025	2TCB-V25S *	
C32	25	100		21K124570	P288N-25		CUB2P25	GEM-3025	2TM-P25	
C33	2.7		NPO ± .25mmf	21R125699					5TCCB-V27S ± .25mmf*	
C34	.1	400		21R11006	P488N-1	DF-104	CUB4PI	GEM-401	4TM-P1	
C35	1000		10%	21A121678	DI 1000			JL-210	5GA-DI1S 10% *	
C36	.75			21K735623						
C37	18		N150 10%	21R120578						
C38	5000	1000		21K738298	DAC-9	DD-502	BYA10D5	JL-350	20HK-D6	
C39	5000	1000		21K738298	DAC-9	DD-502	BYA10D5	JL-350	20HK-D6	
C40	47		NPO 10%	21R115583	NPO-DI 47	DTZ-47		CNO-447	5TCC-Q47S 10% *	
C41	5000	1000		21K738298	DAC-9	DD-502	BYA10D5	JL-350	20HK-D5	
C42	5000	1000		21K738298	DAC-9	DD-502	BYA10D5	JL-350	20HK-D6	
C43	18		N150 10%	21R120578					5TM-P18	
C44	150			21K745777	BPD-00015	DD-151	L10T15	B-315	5GA-T15	
C45	.75			21K735623						
C46	5000	1000		21K738298	DAC-9	DD-502	BYA10D5	JL-350	20HK-D6	③
C47	5000	1000		21K738298	DAC-9	DD-502	BYA10D5	JL-350	20HK-D6	
C48	10000			21K738700	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C49	18			21K120578	DI 18	DD-180	L10Q18	CNO-418	5GA-Q18	
C50	.1	400		21R11006	P488N-1	DF-104	CUB4PI	GEM-401	4TM-P1	
C51	470		10%	21K121797	DI 470	MD-471		JL-347	5GA-T47S 10% *	
C52	1000		10%	21A121678	DI 1000			JL-210	5GA-DI1S 10% *	
C53	10000		10%	21R121946				JL-110	5GA-S1S 10% *	
C54	10000		10%	21R121946				JL-110	5GA-S1S 10% *	
C55	.1	400		21R11006	P488N-1	DF-104	CUB4PI	GEM-401	4TM-P1	
C56	470	3000		21R121478	SVD-30-470		HVB20T47	XEV-347	20GA-T47	
C57	.02	600		21R122079	P688N-02		CUB623	GEM-612	6TM-S2	
C58	.007	200	10%	21K74231		DDI6-702		GEM-1627	5BF-D7	
C59	10000			21R482726	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C60	.01	600	10%	21R122265			PM 6K	GEM-1611	6TM-S5 10% *	
C61	.06	600		21R122268	P688N-06	DF-503	CUB626	GEM-615	6TM-S5	

CAPACITORS (cont)

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C62	.02	600		5R122079	P688N-02		CUB622	GEM-612	6TM-S2	
C63	20000			21B741862	BPD-02	DD-203	BYB502	B-120	5GA-S2	
C64	.06	200		5R121005	P288N-06	DF-503	CUB225	GEM-615	2TM-S5	
C65	.015	200		5K735821	P288N-015	DDI6-153	CUB5S15	GEM-4115	5TM-S15	
C66	.05	400		5R121567	P488N-05	DF-503	CUB435	GEM-415	4TM-S5	
C67	.01	200		5R121005	P288N-05	DF-503	CUB225	GEM-415	2TM-S5	
C68	.02	200		5R121003	P288N-02		CUB222	GEM-412	2TM-S2	
C69	82		N750 10%	21R128698		DTZ-82	C10Q82U	CN7-482	5TCU-Q82S 10% *	
C70	.0039	400	10%	5K125942			PM6D4	GEM-1634	6TM-D39S 10% *	
C71	680		10%	21K736046	1464-00068		1B5T68		5GA-T68 10% *	
C72	390		10%	21K748364	DI390	MD-391	L10T39		5GA-T39S 10% *	
C73	5000			21R115313	BPD-005	DD-502	BYA10D5	B-350	5HK-D5	
C74	.1	400		21R11006	P488N-1	DF-104	CUB4PI	GEM-401	4TM-P1	
C75	.1	600		21R121869	P688N-1	DF-104	CUB6PI	GEM-601	6TM-P1	
C76	.1	600		21R121869	P688N-1	DF-104	CUB6PI	GEM-601	6TM-P1	
C77	.05	1000		21R121870	P1088N-05		CUB10S5	GEM-1015	10TM-S5	
C78	180	3000		21R129134	HVD-30-180	DD30-181	HVB30T18		30GAB-T18	
C79	180	3000		21R129134	HVD-30-180	DD30-181	HVB30T18		30GAB-T18	
C80	82	2000	10%	21R126150				2DY-462	20GA-Q82S 10% *	
C81	10000	1400		21R124832	DAC-27	DDI6-103	HVE16S	2EV-110	20HK3-S1	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.
① Not used in chassis coded A-00.
② Some versions may use 47mmf in this application (Part #21R11593).
③ Not used in some versions.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	MOTOROLA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	250Ω	½	18K748009					Contrast
B	1meg	½						Volume
C	Switch							Push-Push Switch
R2A	3meg	½	18K748431	B-35	A47-3meg-Z	QI1-140	UB9	Treble
B	Shaft			Not Req.	EB8-3	Not Req.	Not Req.	
R3A	3meg	½	18K748431	B-35	A47-3meg-Z	QI1-140	UB9	Bass
B	Shaft			Not Req.	EB8-3	Not Req.	Not Req.	
R4A	250 K	½	18K748870		B47-250K-S*	BII-130 *	TA354L *	Brightness, Stop ① 125 K
B	Shaft				Not Req.	TM-3 KH	Not Req.	
R5A	2meg	½	18K748948		B47-2meg-S	BII-139	TA36L	Vert. Hold
B	Shaft				Not Req.	TM-3 KH	Not Req.	
R6A	4meg	½	18K743534	AB-36	A47-4meg-S	QI1-141		Vert. Size
B	Shaft			AK-19	RN-3	TQ		
R7A	2meg	½	18K743533	AB-76	B47-2meg-S	QI1-139	PTA26L	Vert. Linearity
B	Shaft			AK-19	Not Req.	TQ	Not Req.	
R8A	70K	½	18K748235	AB-35	A47-75K-S	QI1-125		Horiz. Hold
B	Shaft			AK-19	RN-3	TQ		
R9A	5000Ω	2(WW)	17B748869		A43-5000			Horiz. Size
B	Shaft				RN-3			

† "RTA-LOC" Equivalent: FB2ELL, OS837, RUP18A.
* Use 13K resistor in series with left hand (CCW) terminal.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R10	2300Ω		5R6068	
R11	1000Ω		5K127690	
R12	8200Ω	3	17K738283	
R13	56Ω		5R5514	
R14	10K		5K119932	
R15	1000Ω		5K127960	
R16	8300Ω	3	17K738283	
R17	47Ω		5K127543	
R18	680K		5K136229	
R19	1000Ω		5K127960	
R20	15K		5K119814	
R21	8200Ω	3	17K738283	
R22	12K	3	17K744537	
R23	47K	2	5R5735	
R24	120Ω		5K128226	
R25	68K		5K136507	Note 1
R26	47K		5K121298	
R27	3900Ω		5K121931	
R28	220K		5K123232	
R29	1000Ω		5R6054	
R30	100K		5K123313	
R31	33K		5K121704	
R32	2.2meg		5K127001	
R33	1.5meg 5%		5K127000	
R34	15meg 5%		5K125891	
R35	33K		5K127532	
R36	18K		5K122848	
R37	5600Ω	10	17K747979	
R38	820K		5K120230	
R39	47K	4	17K743157	
R40	4700Ω		5K128847	
R41	5800Ω	1	5R6501	
R42	270Ω		5K121303	
R43	100K		5K125534	
R44	56K		5K127508	
R45	120K		5K127540	
R46	560K		5K134507	
R47	270K		5R6414	
R48	68K		5K125179	
R49	560K		5K128228	
R50	15K	3	17K749181	
R51	560Ω		5K122802	
R52	47K		5K121299	

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R53	100K		5K125534	
R54	10K		5K119932	
R55	100K		5K125534	
R56	33K		5K127532	
R57	180Ω		5K122446	
R58	680K		5K128229	
R59	220Ω		5K125471	
R60	4700	2	5K125146	
R61	150Ω	1	5K128232	
R62	82Ω	1	5R4841S	
R63	2.2meg		5K127001	
R64	16K		5K122848	
R65	5.6meg		5K124781	
R66	1meg		5K124494	
R67	1meg		5K122324	
R68	15K		5K119924	
R69	180K		5K125531	
R70	220K		5R6015	
R71	470K		5K119406	
R72	22K		5K119935	
R73	16K		5K122848	
R74	6200Ω		5K119931	
R75	22K		5K119935	
R76	150Ω	2	5K119403	
R77	560Ω		5K122802	
R78	560Ω		5K122802	
R79	12Ω	1	5K127508	
R80	8200Ω		5K119931	
R81	1000Ω		5K119932	
R82	39K		5K121931	
R83	56K		5K128228	
R84	68000Ω		5K119930	
R85	1meg		5K124494	
R86	470Ω		5K127833	
R87	12Ω	1	5K127508	Note 2
R88	6300Ω	2	5K120579	
R89	330K		5K128227	
R90	68000Ω	1	5R124699	
R91	5.2Ω	1	5K128098	
R92	22K	1		Note 3
R93	470K		5K119406	
R94	3900Ω		5K121931	
R95	62000Ω	3	17K738283	

Note 1. Not used in chassis coded A-00.
Note 2. Not used in some versions.
Note 3. Some versions may use 27K 1W in this application (Part #6K12901).

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		MOTOROLA PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	47.25MC Trap	24C747584	20-1049	TV-153 ■			
L2	39.75MC Trap	24K747583	20-1044 ▲	TV-152			
L3A	1st Video IF	24K747586					
B	41.25MC Trap						
L4	47.25MC Trap	24K747585	20-1049	TV-153 ■			
L5	2nd Video IF	24K747587	17-4522	TV-130	6219	VF-3	
L6	3rd Video IF	24K747587	17-4522	TV-130	6219	VF-3	
L7	4th Video IF	24K747589					Includes M5
L8	Resonant Choke	24K733225					10 Microhenries
L9	Resonant Choke	24K733225					10 Microhenries
L10	Series Peaking Coil	24K744411	19-3100 ■	TV-131 ▲	6113 ■	VP-3 ■	100 Microhenries, wound on 5600Ω resistor
L11	Shunt Peaking Coil	24D733606	19-3180	TV-134	6180	VP-5	180 Microhenries
L12	4.5MC Trap	24K739290	20-1004	TV-121	1469 ■	SF-3	
L13	Series Peaking Coil	24K746871	19-3300 ■	TV-200 ▲	6133 ■	VP-7 ■	330 Microhenries, wound on 5600Ω resistor
L14	Shunt Peaking Coil	24K744410	19-4400	TV-202	6136		400 Microhenries
L15	Shunt Peaking Coil	24K743340					1400 Microhenries, wound on 2700Ω resistor
L16	Resonant Choke	24R119889					8.5 Microhenries
L17	Resonant Choke	24K743727					7.5 Microhenries ①
L18	1st Sound IF	24D743453					Tapped ③ 1.7Ω
L19	2nd Sound IF	24B738943	17-3496 ♦	TV-113 ♦	6303 ♦	SF-2 ♦	
L20	3rd Sound IF	24B738943	17-3495 †	TV-113 †	6303 †	SF-2 †	
L21	Quadrature Coil	24K746031					
L22	RF Choke	24B747171			4611		7.8 Microhenries
L23	RF Choke	24B747171			4611		7.8 Microhenries
L24	Fil. Choke	24K743875	19-1001	BC-562	4804		1.8 Microhenries

■ Remove capacitor supplied and use original C7, C12 or C26 depending upon circuit.
■ Disregard tap.
▲ Parallel with 5600Ω resistor.
♦ Disconnect C37.
† Disconnect C43.
① IRC Part #CLA.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA						NOTES
	PRI.	SEC.	MOTOROLA PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	Thordarson PART No.	
L25	40Ω		24K743426	19-1576 *	TV-165 ▲	6210 *	H-102 *	H3-5 *	Horiz. Freq.

* Drill larger mounting hole. ▲ Disregard tap.

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE @ CURRENT 1000 ~(.)	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L26	.315A	42Ω	1.5 Hy.	25K745693 ①	C5037	C-2996	F-801	C-2328	26C83	C-17X

① Chassis coded A-00 use part #25K747649.

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ 2.1A	560VCT @ .315A	6V @ 5A	25K747177 ①						
	SEC. 3	SEC. 4	SEC. 5							
	6.3V @ 9.3A									

① Alternate Part #25D747177.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA							
		MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Rogers PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Vert. Output	25K744974	21803 ①	A-2853 ③	V309 ①	VO-26 ①	VO-100 ③	26S51 ①	A-102X
T3	Yoke-Horiz. (24MH) (90°)-Vert. (39MH)	24D743765	DF-810 ③④⑤⑦	MDF-97 ③⑤⑤		MY-3 ③⑤		Y-15 ③④⑤⑦	Y-45-2 ③
	Alt. Yoke	24K744322							YC-1
	Rear Cover & Centering Device	59C72U45							
	Yoke Clamp	42A736175							CL-1
	Yoke Retainer	42A736257							
T4	Horiz. Output	24K743197							
	Pri. Coil	24K748398							
	Sec. Coil	24K745108							

① Connect as autoformer.
② Tape blanking lead.
③ Use original pin cushion magnet assembly.
④ Use original yoke plug and leads.
⑤ Remove jumper between vertical and horizontal windings.
⑥ Use original yoke damping network, if necessary.
⑦ Use original rear cover and centering device.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T5	5000Ω	8-8Ω	25K749146	21002	A-2902	AU-604	A-3337	24S64	S-53X	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	MOTOROLA PART No.	QUAM PART No.	
SP1	8"	PM	8-8Ω	50K749397 ①	8A3IZ6. 7	① Used in Models 21K104B, M, W, Y21K104B, M, W, 21K105B, 21K109M
SP2	4"	PM	8-10Ω	50C745515 ②③	4A1TZ8. 7 ②	② Connect in series and phase.
SP3	4"	PM	8-10Ω	50K745185 ②③④	4A1TZ9 ②	③ Manufacturer states to order Part #50K746444 as a replacement.
	6" x 9"	PM	8Ω	50K749582 ③		④ Used in Models 21K104B, M, W, Y21K104B, MC, W 21K105B, MC, W
	5"	PM	8Ω	50C749580 ②④		⑤ Used in Model 21K110W
	5"	PM	8Ω	50D749580 ②⑤		⑥ Used in Models 21K108W, 21K109M

MOTOROLA MODELS 21K104B, M, W, 21K105B, MC, W, 21K110W, 21K110WM, 21K111W, Y21K104B, M, W (Ch. TS-552, TS-552A)

FOLDER 1

PARTS LIST AND DESCRIPTIONS (Continued)

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	MOTOROLA PART No.	REPLACEMENT DATA
K1	Sync Input	27mmf, 220mmf, 2000mmf, 56K, 56K, 470K, 560K, 3.3meg	51B747693	Sprague HN-5
K2	Sync Output	2000mmf, 3300mmf, 4700mmf, 2200Ω, 2200Ω,27K, 180K	51B747379	Sprague VF-3
K3	Horiz. AFC	1000mmf, 1000mmf, 3300mmf, 100K, 100K, 4.7meg	51B747561	Sprague F-4

RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	MOTOROLA PART No.	FEDERAL PART No.	GENERAL ELECTRIC PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1		48B742698 ①	K1616 ①		SD-91 ②		① Selenium Type. ② Silicon Type, 2 used.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			MOTOROLA PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG	5A 250V	65A742612	31A737466	312005. (3AG-5A-250V)	357001	MTH5	4406
M3	N	3/10A 125V S/B	65B743104	9K743152	333.300 (N-3/10A-125V-S/B)	346008	N 3/10	HN 0 to 3/10
M4	2" Length of #26 Wire							

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		MOTOROLA PART No.	CBS PART No.	SYLVANIA PART No.	
M5		48K747548	1N60	1N295	Video Detector (Clip-in)

MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M6	Lamp	65K749184	Type #81X
M7	Tuner	1U748447	VHF (TT-108) Ch. TS-552
	Tuner	1U748448	VHF with UHF provisions (TT-108Y) Ch. TS-552Y
	Tuner		UHF (TT-89) Ch. TS-552Y
M8	Thermal Switch	6C746780	
M9	Magnet	48B737365	Anti-Pin Cushion

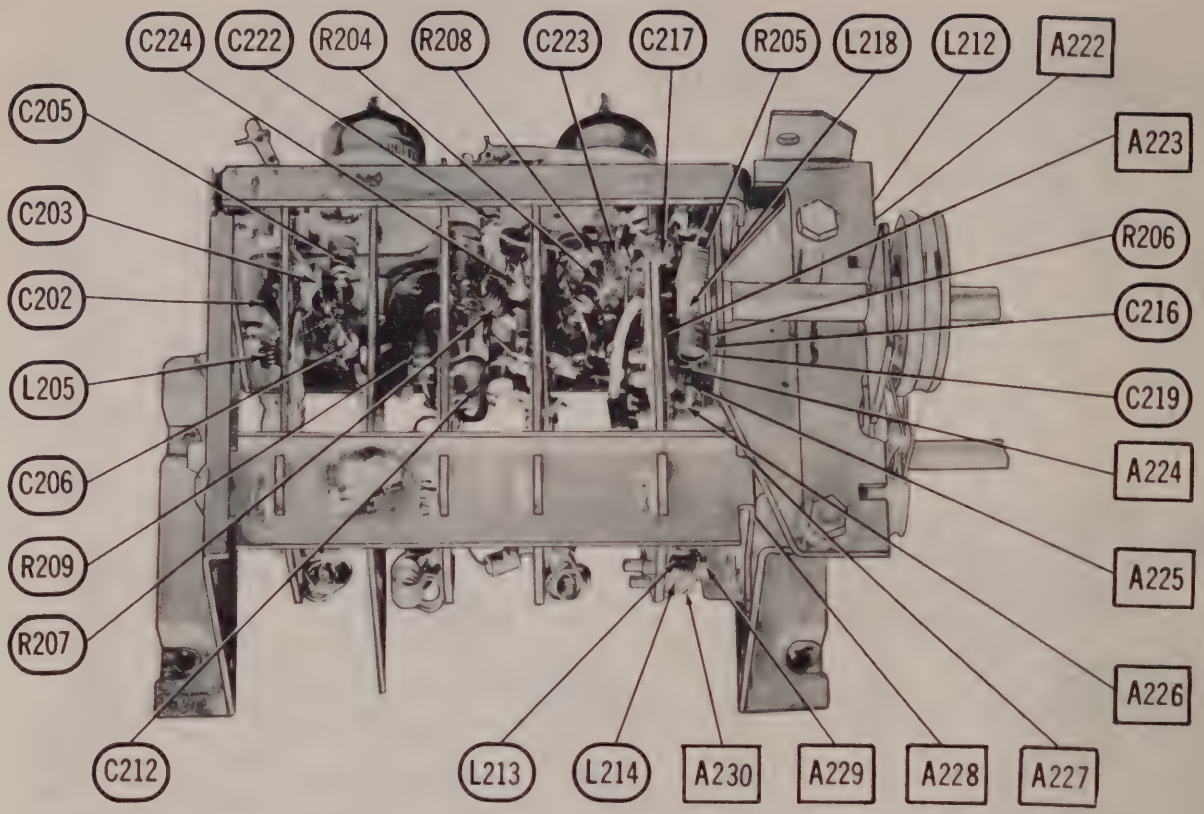
CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

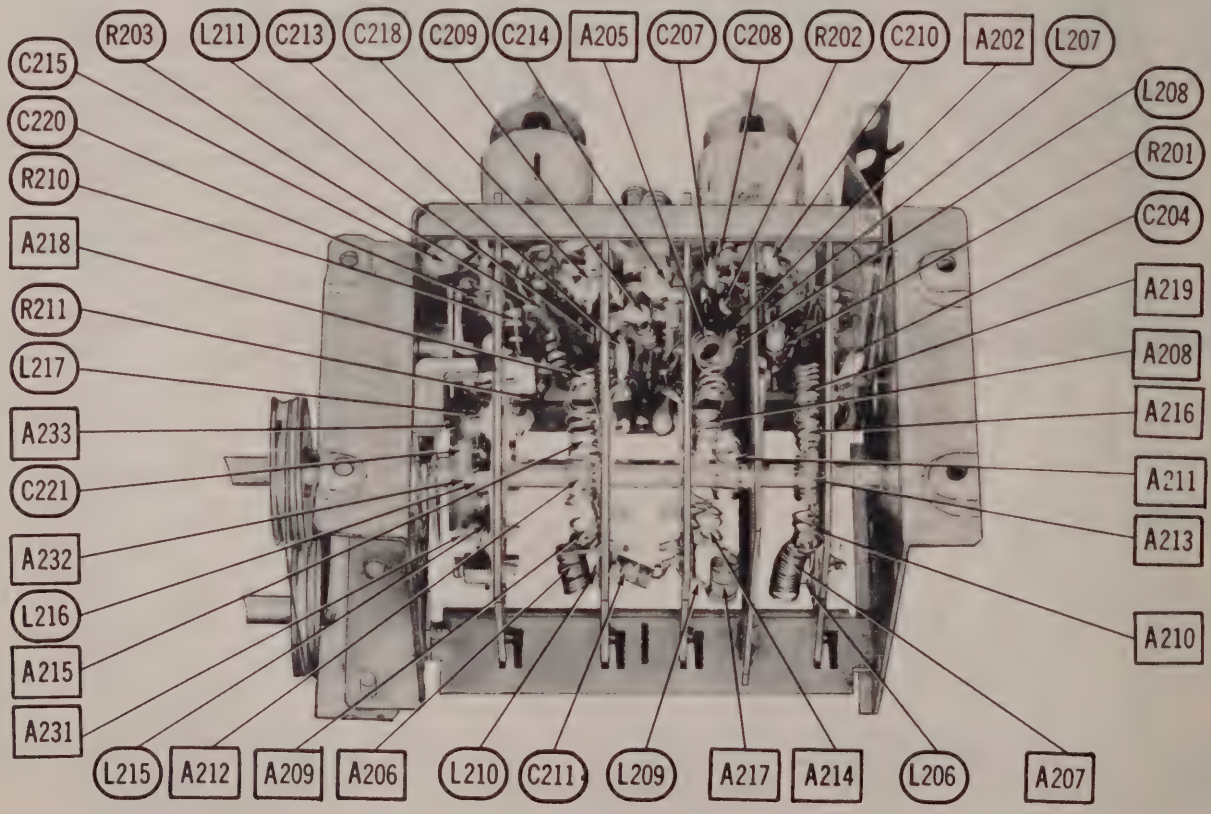
NAME	PART NO.	DESCRIPTION
Safety Glass	61C747252	
Mask	13K748041	
Window	61A748191	Channel Indicator
Escutcheon	13A748192	Channel Indicator
Knob	1V748504	VHF Channel Selector
Knob	1V748512	Fine Tuning, VHF Models
Knob	1V748517	Fine Tuning, UHF-VHF Models
Knob	1V748505	Volume, On-Off
Knob	36B743431	Brightness, Vert. Hold
Knob	36C748137	Contrast
Knob	36K746089	Horiz. Hold
Knob	36B748094	Treble, Bass
Dial	1A748205	Channel Indicator
UHF Dial	34C748136	Models Y21K104B, M, W
Cabinet	16K748254	Mahogany, Models 21K104M, Y21K104M
Cabinet	16K748253	Blond Oak, Models 21K104B, Y21K104B
Cabinet	16E748252	Walnut, Models 21K104W, Y21K104W
Cabinet	16K748584	Blond Oak, Model 21K105B
Cabinet	16K748805	California Mahogany, Model 21K105MC
Cabinet	16E748583	Walnut, Model 21K105W
Cabinet	16E748433	Walnut, Model 21K108W
Cabinet	16F748434	Mahogany, Model 21K109M
Cabinet	16E748435	Walnut, Model 21K110W
Leg	16K744293	Right Hand, Models 21K104B, Y21K104B
Leg	16K744291	Left Hand, Models 21K104B, Y21K104B
Leg	16K748256	Right Hand, Models 21K104M, Y21K104M
Leg	16K748255	Left Hand, Models 21K104M, Y21K104M
Leg	16K746005	Right Hand, Models 21K104W, Y21K104W
Leg	16K746006	Left Hand, Models 21K104W, Y21K104W
Leg	16K745198	Model 21K105B
Leg	16K748807	Model 21K105MC
Leg	16K748591	Model 21K105W
Leg	16K749075	Model 21K108W

WIRING DATA

High Voltage Lead	Use BELDEN No. 8869
Shielded Hook-up Wire	Use BELDEN No. 8885 (Single Conductor) 8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No. 8874
300Ω Tuner Input Lead	Use BELDEN No. 8225
300Ω Antenna Lead-in	Use BELDEN No. 8230 or 8275
Antenna Rotor Cable	Use BELDEN No. 8464 (Flat) or 8484 (Round) - 4 Conductor 8485 (Round) - 5 Conductor 8488 (Round) - 8 Conductor



TUNER 1U748447 - LEFT SIDE



TUNER 1U748447 - RIGHT SIDE

TUNER ALIGNMENT INSTRUCTIONS (cont)

VHF OSCILLATOR ALIGNMENT

The tuner shield must be in place when adjusting the oscillator.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the Fine Tuning to the center of its range.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC	211.25MC 215.75MC	13	Vert. Amp. thru 47K across Video Det. load.	A222	Adjust to place sound marker in trap notch as in Fig. 203. Video marker should fall at 50%.
			207MC	205.25MC 209.75MC	12		A223	
			201MC	199.25MC 203.75MC	11		A224	
			195MC	193.25MC 197.75MC	10		A225	
			189MC	187.25MC 191.75MC	9		A226	
			183MC	181.25MC 185.75MC	8		A227	
			177MC	175.25MC 179.75MC	7		A228	
			85MC	83.25MC 87.75MC	6		A229	
			79MC	77.25MC 81.75MC	5		A230	
			69MC	67.25MC 71.75MC	4		A231	
			63MC	61.25MC 65.75MC	3		A232	
			57MC	55.25MC 59.75MC	2		A233	

UHF IF ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	50Ω Carbon Resistor	High side to point (V). Low side to chassis.	44MC (10MC Swp)	41.25MC 45.75MC	Any UHF channel	Vert. Amp. thru 47K to point (U). Low side to chassis.	A234, A235	Adjust for maximum gain and symmetry of response similar to Fig. 204 with markers as shown.
13.	Disconnect sweep generator and short antenna terminals.				"	USE VTVM Across Video Det. load.	A236	Adjust for maximum DC noise voltage.

UHF ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

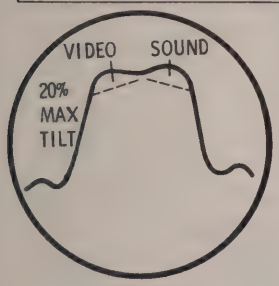


FIG. 201

FIG. 202

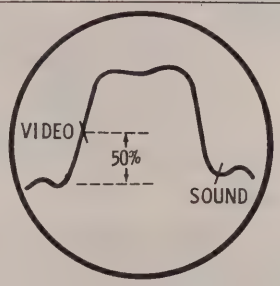


FIG. 203

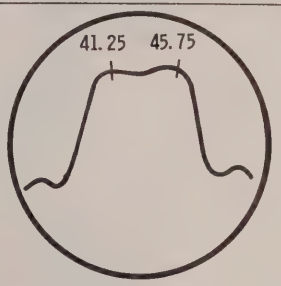
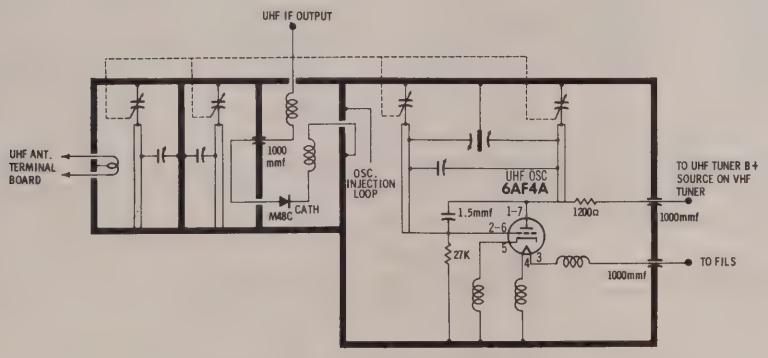


FIG. 204



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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UHF TUNER TT-89

TUNER PARTS LIST AND DESCRIPTIONS

1U748447 (TT-108)

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	6BK7B	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	6U8A	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	27		21R122050			C10Q27U	CN7-427	5TCU-Q27S 5% *	N750 5%
C202	15		21R124919	N750-DI 15	DTN-15	C10Q15U	CN7-415	5TCU-Q15S 10% *	N750 10%
C203	5.6		21R121154					5TCU-Q5.6S ±.5mmf *	N750 ±.5mmf
C204	1000		21R115386	BPD-001	DD-102	BYA10D1M	B-210	5HK-DI	
C205	1000		21K739920	EF-001	MFT-1000			503C-DI	
C206	2.7		21R115950					5TCCB-V27S 10%*	
C207	1000		21R115386	BPD-001	DD-102	BYA10D1M	B-210	5HK-DI	
C208	1.5		21R115959	NPO-SI 1.5	TCZ-1R5	CTA6V15C	ZT-5515	5TCCB-V15S 10%*	10%
C209	.5-3		21K735985		829-3				
C210	1000		21R115386	BPD-001	DD-102	BYA10D1M	B-210	5HK-DI	
C211	1.5		21R115959	NPO-SI 1.5	TCZ-1R5	CTA6V15C	ZT-5515	5TCCB-V15S 10%*	10%
C212	100		21R120577	DI-100	D6-101	CTA6T1U	CNO-310	5TCC-T1	10%
C213	22		21R124554	NPO-DI 22	DTZ-22	C10Q22C	CNO-422	5TCC-Q22S 5% *	5%
C214	.5-3		21K735985		829-3				
C215	1.0		21R114071						N1500 ±.5mmf
C216	470		21R114554	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C217	470		21R114554	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C218	1000		21R115386	BPD-001	DD-102	BYA10D1M	B-210	5HK-DI	
C219	15		21R125066		DTZ-15		CNO-415	5TCC-Q15S 5% *	NPO 5%
C220	15		21R125077		DTZ-15		CNO-415	5TCC-Q15S 5% *	NPO 5%
C221	1.0		21R124552						NPO 2.5%
C222	1000		21K739920	EF-001	MFT-1000			503C-DI	
C223	1000		21K739920	EF-001	MFT-1000			503C-DI	
C224	1000		21K115386	BPD-001	DD-102	BYA10D1M	B-210	5HK-DI	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R201	22K		6K119405	
R202	100K		6K122313	
R203	4700Ω		6K121847	
R204	39K		6K125535	
R205	15K		6K119934	
R206	15K		6K119934	

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R207	270K		6R6414	
R208	15K		6K119934	
R209	470Ω		6K127633	
R210	3300Ω		6K121725	Note 1
R211	1000Ω		6K127960	Note 2

Note 1. Not used in some versions.
Note 2. Some versions may use 3300Ω in this application.

COILS (RF-IF)

ITEM No.	USE	MOTOROLA PART No.	NOTES
L201	IF Trap	24B747530 †	
L202	IF Trap	24B747530 †	
L203	Ant. Trans.	24B747543 †	
L204	FM Trap	24B747801 †	
L205	Ant. Coil	24A744031	Channel 13
L206	Ant. Coils	24K748713	Channel 2 - 6
L207	RF Choke	24A739397	
L208	RF Coil	24A739361	Channel 13
L209	RF Coils	24K740811	Channel 2 - 6
L210	Mixer Grid Coils	24K740041	Channel 2 - 6

ITEM No.	USE	MOTOROLA PART No.	NOTES
L211	Mixer Grid Coil	24A741232	Channel 13
L212	Osc. Coil	24K746879	Channel 13
L213	Osc. Coil	24K739385	Channel 6
L214	Osc. Coil	24K739384	Channel 5
L215	Osc. Coil	24K739381	Channel 4
L216	Osc. Coil	24K739382	Channel 3
L217	Osc. Coil	24K739381	Channel 2
L218	Mixer Plate Coil	24B747599	

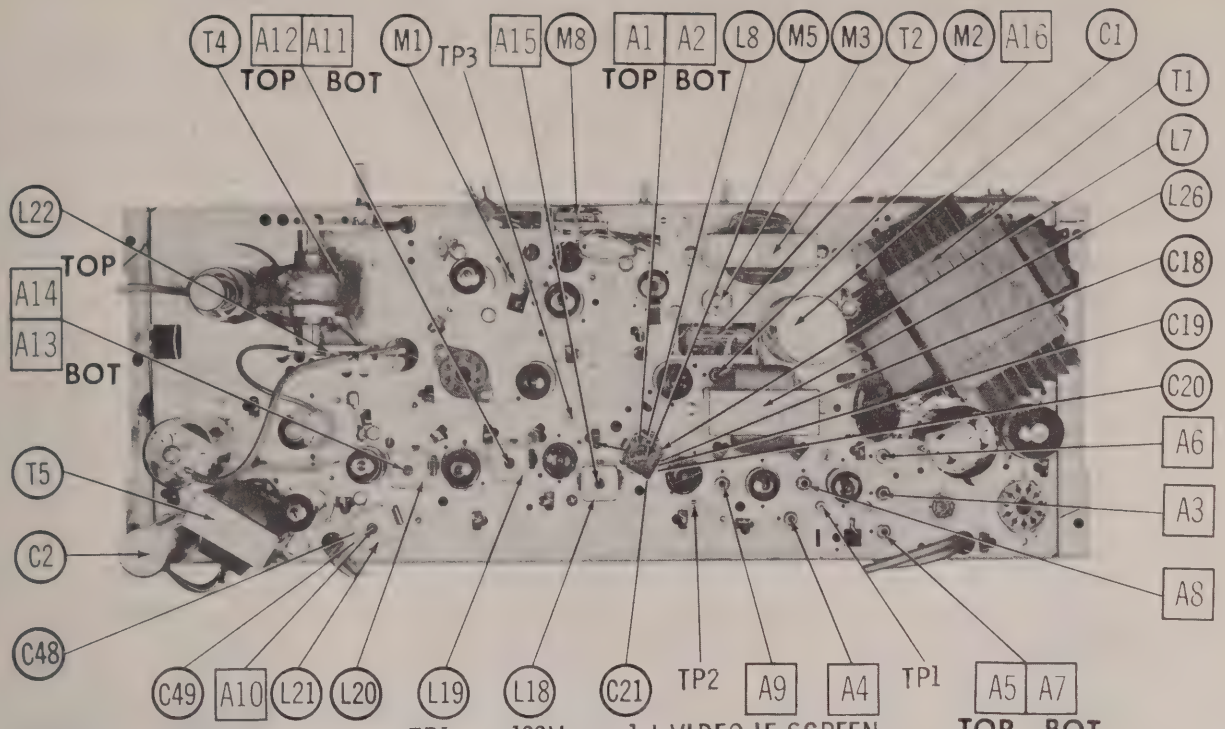
† Part of M201 (Part #1V747644).

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	MOTOROLA PART No.	REPLACEMENT DATA
K201	Antenna Network	10mmf, 22mmf, 470K	51C747535	
K202	Antenna Network	10mmf, 22mmf, 470K	51C747535	

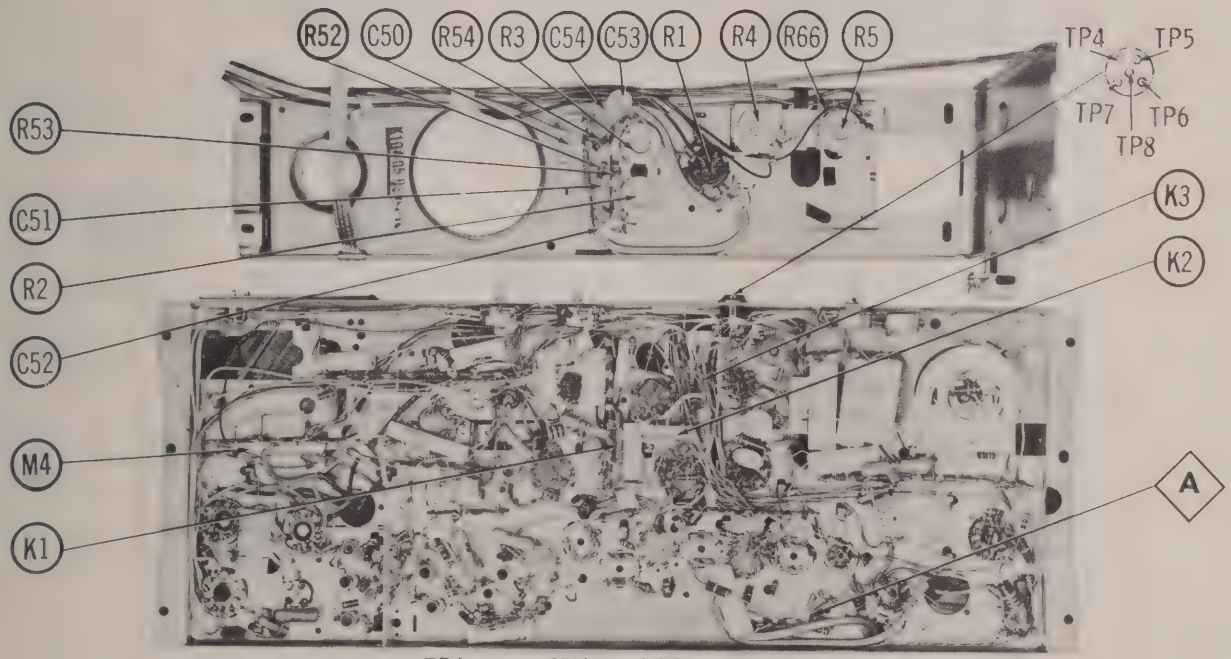
MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M201	Antenna Network	1V747644	High Pass Filter Assy.



TP1	100V	1st VIDEO IF SCREEN
TP2	0V	3rd VIDEO IF GRID
TP3	-.4V	VIDEO OUTPUT

CHASSIS TOP VIEW



TP4	-.45V	AGC
TP5	230V	HORIZ MULT
TP6	0V	GROUND
TP7	.65V	HORIZ AFC
TP8	260V	B+

CHASSIS BOTTOM VIEW & CONTROL BRACKET ASSEMBLY

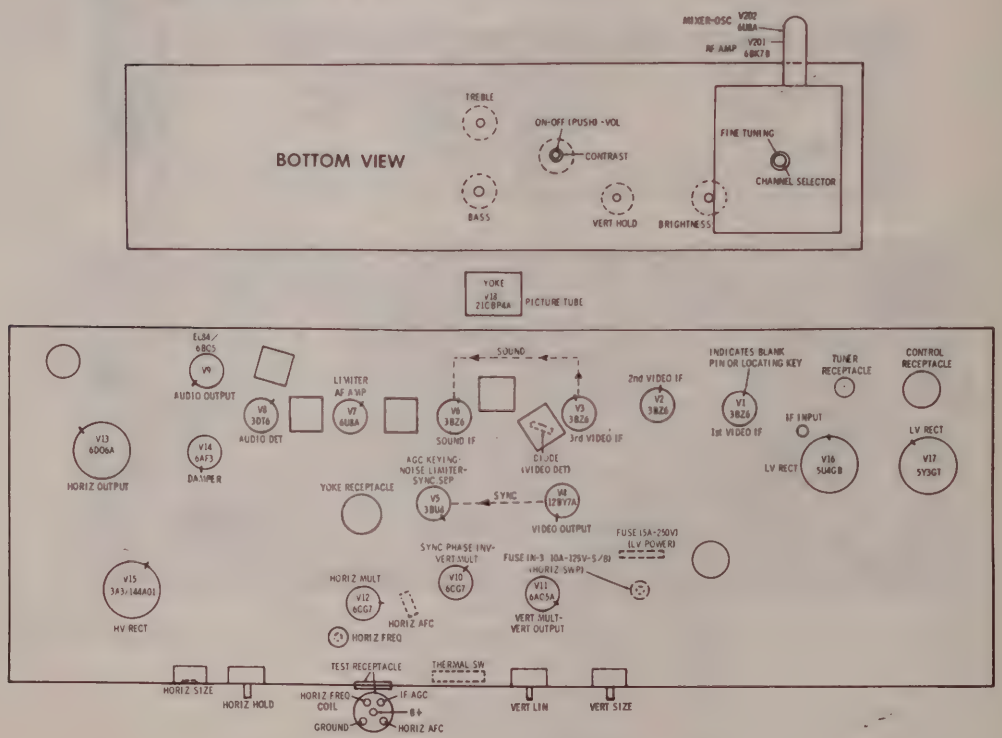
RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	3BZ6	600K	56Ω	.1Ω	.4Ω	†8200Ω	†8200Ω	0Ω		
V2	3BZ6	600K	47Ω	0Ω	.4Ω	†8200Ω	†8200Ω	0Ω		
V3	3BZ6	1000Ω	120Ω	.4Ω	0Ω	†8200Ω	†8200Ω	0Ω		
V4	12BY7A	• 20Ω	72K	0Ω	.1Ω	.1Ω	0Ω	†5000Ω	†11K	0Ω
V5	3BU8	†3900Ω	†47K	2meg	.1Ω	.4Ω	†38K	†870K	†2.2meg	†3.8Meg
V6	3BZ6	4700Ω	270Ω	.1Ω	.4Ω	†23K	†23K	0Ω		
V7	6U8A	†130K	100K	†60K	0Ω	.1Ω	†85K	0Ω	1800Ω	0Ω
V8	3DT6	7.5Ω	560Ω	.4Ω	0Ω	†300K	†15K	560K		
V9	EL84 6BQ5	680K	680K	150Ω	0Ω	.1Ω	NC	†950Ω	NC	†690Ω
V10	6CG7	•†1.7meg	•1.6meg	0Ω	0Ω	.1Ω	†33K	56K	2200Ω	0Ω
V11	6AQ5A	•1.5meg	0Ω	0Ω	.1Ω	†600Ω	†150Ω	•1.5meg		
V12	6CG7	†60K	• 60K	1000Ω	0Ω	.1Ω	†12K	4.8meg	1000Ω	NC
V13	6DQ6A	TP	0Ω	NC	• †13K	1meg	TP	.1Ω	12Ω	TOP CAP †11.5Ω
V14	6AF3	NC	TP	NC	0Ω	.1Ω	NC	NC	TP	†2.5Ω
V15	3A3	PINS 1 THRU 8 HAVE INFINITE RESISTANCE								TOP CAP †260Ω
V16	5U4GB	NC	¶	NC	18Ω	NC	18Ω	NC	¶	
V17	5Y3GT	NC	¶	NC	18Ω	NC	18Ω	NC	¶	
V18	21CBP4A	0Ω	100K	Pin 6 †360K	Pin 10 †360K	Pin 11 • 240K	Pin 12 .1Ω			
V201	6BK7B	†470Ω	INF	INF	0Ω	.1Ω	INF	3.5meg	0Ω	0Ω
V202	6U8A	†11K	44K	†280K	0Ω	.1Ω	†26K	0Ω	0Ω	15K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

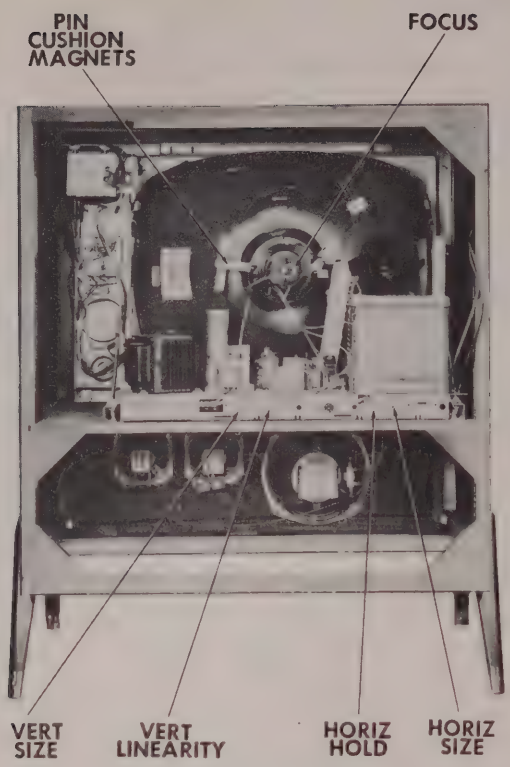
TOP CAP 5meg

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
• THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.
† MEASURED FROM 260V SOURCE
ǂ MEASURED FROM TOP CAP OF V14.

NC NO CONNECTION.
TP TIE POINT.



TUBE PLACEMENT CHART



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Suggested Alignment Tools: GENERAL CEMENT #8721, 8722
WALSCO #2519

Turn the set on and tune in a TV station, preferably with a test pattern. Adjust the Brightness and Contrast controls for a normal picture.

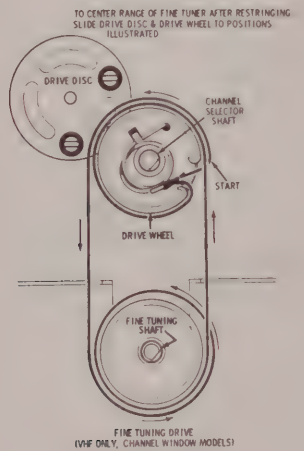
Short out the AFC voltage by connecting a clip lead from TP-7 to chassis. Connect a .1mfd 400 volt capacitor from TP-5 to chassis.

Adjust the Horizontal Hold to the point where the picture is almost stable horizontally.

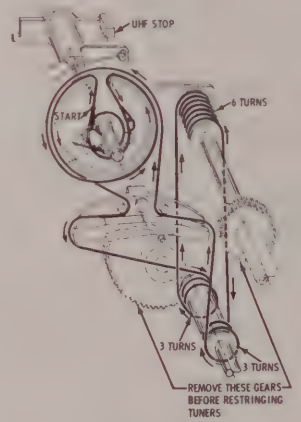
Remove the capacitor from TP-5 and adjust the Horizontal Frequency slug (B1) to the point where the picture is almost stable horizontally.

Remove the clip lead from TP-7 and chassis. Adjust the Horizontal Hold control until the picture is synchronized horizontally.

Adjust the Horizontal Size (R9) for a picture slightly wider than necessary to fill the picture mask horizontally.


TO CENTER RANGE OF FINE TUNER AFTER RESTRINGING SLIDE DRIVE DISC & DRIVE WHEEL TO POSITIONS ILLUSTRATED
DRIVE DISC
CHANNEL SELECTOR SHAFT
START
DRIVE WHEEL
FINE TUNING SHAFT
FINE TUNING DRIVE
(VHF ONLY, CHANNEL WINDOW MODELS)

SEPARATE FINE TUNING MODELS (VHF ONLY)



SEPARATE FINE TUNING MODELS (VHF/UHF)

DRIVE CORD STRINGING

PHOTOFACT* Folder with CIRCUITRACE*

WESTINGHOUSE MODELS H-21CT258, H-21CT259, H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)

IMPORTANT FILING NOTICE

The TV Folder for this envelope will be found among the first folders in this complete Set of folders.

Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.

WESTINGHOUSE MODELS H-21CT258, H-21CT259, H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)

MODEL H-21CT258 (Ch. V-2367-1)

WESTINGHOUSE MODELS H-21CT258, H-21CT259, H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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WESTINGHOUSE MODELS H-21CT258, H-21CT259, H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)

WESTINGHOUSE MODELS H-21CT258, H-21CT259, H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)

MODEL H-21CT258 (Ch. V-2367-1)

WESTINGHOUSE MODELS H-21CT258, H-21CT259, H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)

CAUTION

ONE SIDE OF AC LINE CONNECTED TO CHASSIS.

Care should be exercised when connecting test equipment or physically contacting chassis. Isolation devices employed by manufacturer should be checked and properly connected before returning receiver to owner.

TRADE NAME	Westinghouse	MODELS	CHASSIS
		H-21CT258, H-21CT259	V-2367-1
		H-21CTU258, H-21CTU259	V-2367-2
MANUFACTURER	Westinghouse Electric Corp., Television & Radio Div., Metuchen, N.J.		
TYPE SET	Color Television Receiver		
TUBES	VHF - Twenty-nine, UHF - Thirty		
POWER SUPPLY	110-120 Volts AC, 60 Cycle	RATING 400 Watts, 3.7 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

SET 437 FOLDER 2

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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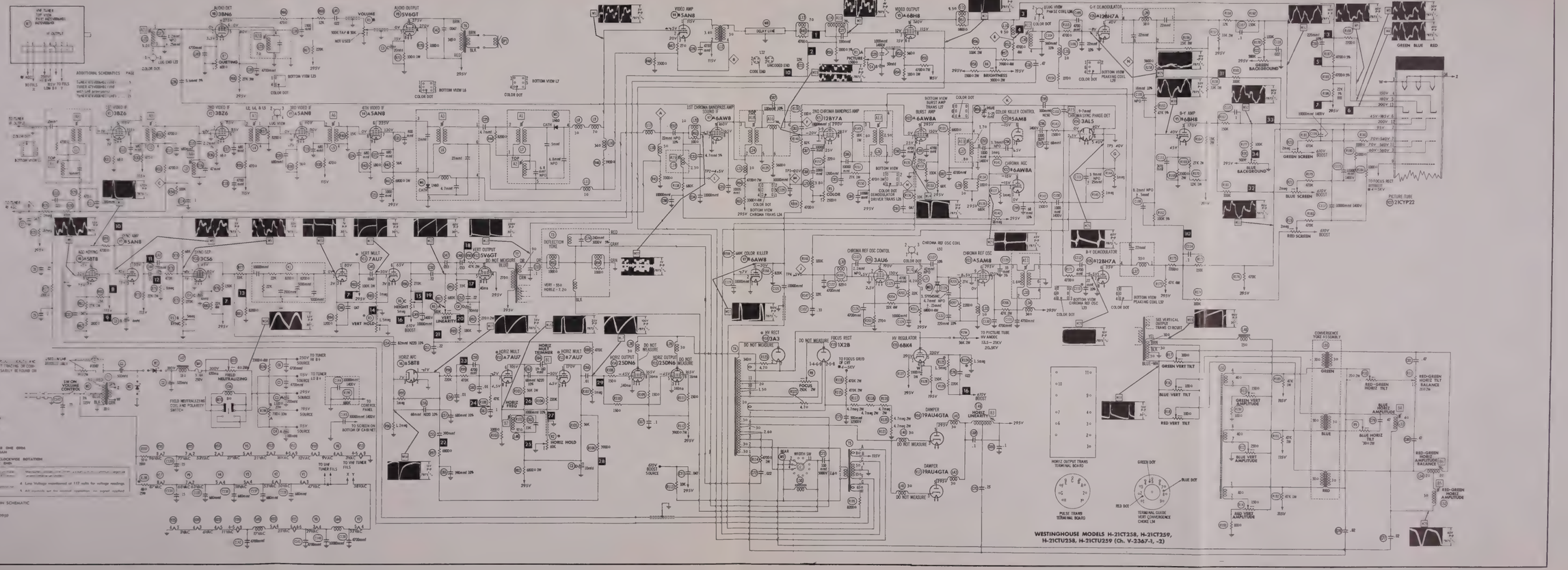
H996


WESTINGHOUSE MODELS H-21CT258, H-21CT259,
H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)
A PHOTOFACT STANDARD NOTATION SCHEMATIC
CIRCUIT TRACE
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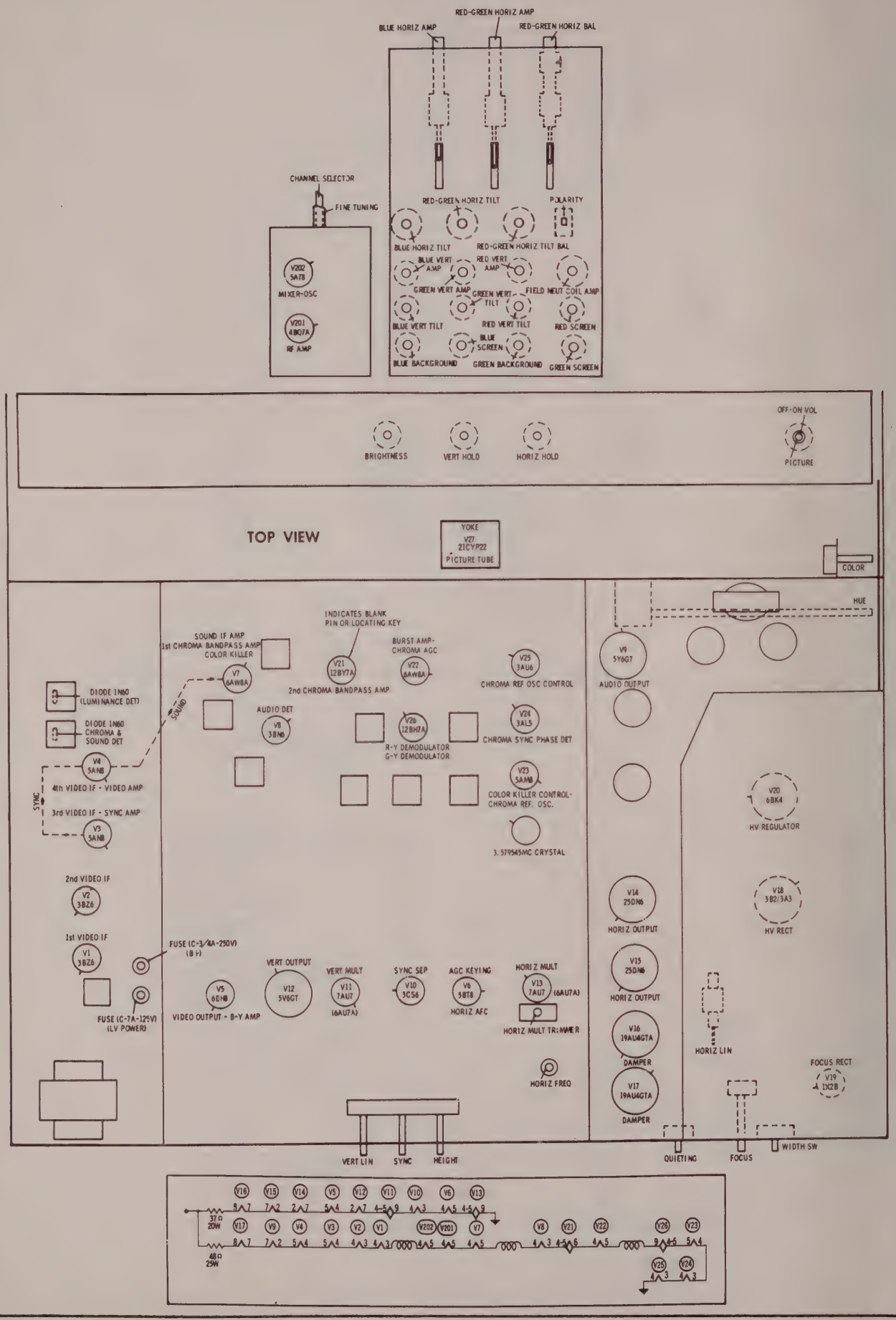
BLOCK DIAGRAM

TUBE PLACEMENT CHART



VHF TUNER 470V006H01
A PHOTOFACT STANDARD NOTATION SCHEMATIC
© Howard W. Sams & Co., Inc. 1959
◆ MEASURED FROM PIN 3 OF V201.
VHF ANT TERM BOARD
RF AMP V201 4BQ7A
MIXER V202 A5AT8
OSC V202 B 5AT8
MIXER PLATE COIL
TEST POINT
HIGH BAND COUPLING
FINE TUNING
TO FILAMENT STRING
IF OUTPUT
HI B+
RF AGC
LO B+
TERM #1
TERM #2
TERM #3
TERM #4
TERM #5
TERM #6
TERM #7
L201
L202
L203
R201 220K
R202 4700Ω
R203 10K
R204 1.5meg
R205 1meg
R206 1000Ω
R207 15K
R208 33K
R209 100K
R210 15K
R211 4700Ω
R212 4300Ω 5%
R213 1800Ω
R214 4700Ω
C201 NPO 12mmf
C202 N750 47mmf
C203 4.7mmf 10%
C204 1.5mmf
C205 3mmf
C206 800mmf
C207 800mmf
C208 800mmf
C209 1000mmf
C210 99mmf N750 10%
C211 99mmf N750 10%
C212 1.8mmf
C213 1.2mmf
C214 5-3mmf
C215 6.8mmf NPO
C216 10mmf
C217 1.5mmf
C218 .39mmf
C219 1.5mmf NPO
C220 .15mmf N330
C221 800mmf
C222 1000mmf
C223 800mmf
C224 1000mmf
C225 800mmf
C226 800mmf
C227 800mmf
C228 5-3mmf
A201
A202
A203
A204
A205
A206
A207
A208
A209
A210
A211
A212
A213

TUNER ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS FOR TUNER 470V006H01

Use an ISOLATION TRANSFORMER to PROTECT the Test Equipment.
The high voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.
Suggested alignment tools: A201, A202, A203, A204 ... General Cement #8607, 9291
Walsco #2520, 2522, 2523, 2524, 2537
A205, A206, A212 ..... General Cement #5004, 5008, 5009
Walsco #2520

VHF OSCILLATOR ALIGNMENT

Set the Fine Tuning to the center of its range. Set the Channel Selector to the highest high band channel operating in the area. Adjust A201 for best picture and sound. Check all other high band channels operating in the area in a descending order and if necessary, adjust the coil for that channel by bending toward or away from the wafer for best picture and sound.
Set the Channel Selector to the highest low band channel operating in the area and adjust the appropriate slug for best picture and sound. A202 is the adjustment for both channel 6 and 5. However, the slug can only be reached when the selector is set to channel 6. Therefore, to adjust channel 5 switch to channel 6, adjust slug then switch back to channel 5 and check picture. Repeat until adjustment is satisfactory. A203 is for adjusting channels 4 and 3 and is adjusted in the same manner switching to channel 4 to adjust channel 3. A204 is for adjusting channel 2.

VHF RF AND MIXER ALIGNMENT

Connect the negative lead of a 2.5 volt bias supply to point ⓣ. Positive to chassis.
Loosely couple marker generator to sweep cable. Adjust marker output so that markers are barely visible as excessive marker amplitude will distort response curve.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Two 120Ω Carbon Resistors	Across VHF antenna terminals with 120Ω in each lead.	207MC	205.25MC 209.75MC	12	Vert. amp. thru 10K to point ⓥ. Low side to chassis.	A205, A206	Adjust for maximum gain and symmetry of response similar to Fig. 201 with markers as shown. DO NOT RETOUCH after this step.
2.	"	"	189MC	187.25MC 191.75MC	9	"	A207	Check for response similar to Fig. 201. If necessary, adjust for desired response.
3.	"	"	183MC	181.25MC 185.75MC	8	"	A208	"
4.	"	"	85MC	83.25MC 87.75MC	6	"	A209	"
5.	"	"	79MC	77.25MC 81.75MC	5	"	A210	"
6.	"	"	69MC	67.25MC 71.75MC	4	"	A211	"
7.	"	"	63MC	61.25MC 65.75MC	3	"	A212	"
8.	"	"	57MC	55.25MC 59.75MC	2	"	A213	"

PRE-ALIGNMENT INSTRUCTIONS FOR TUNER 473V008H01

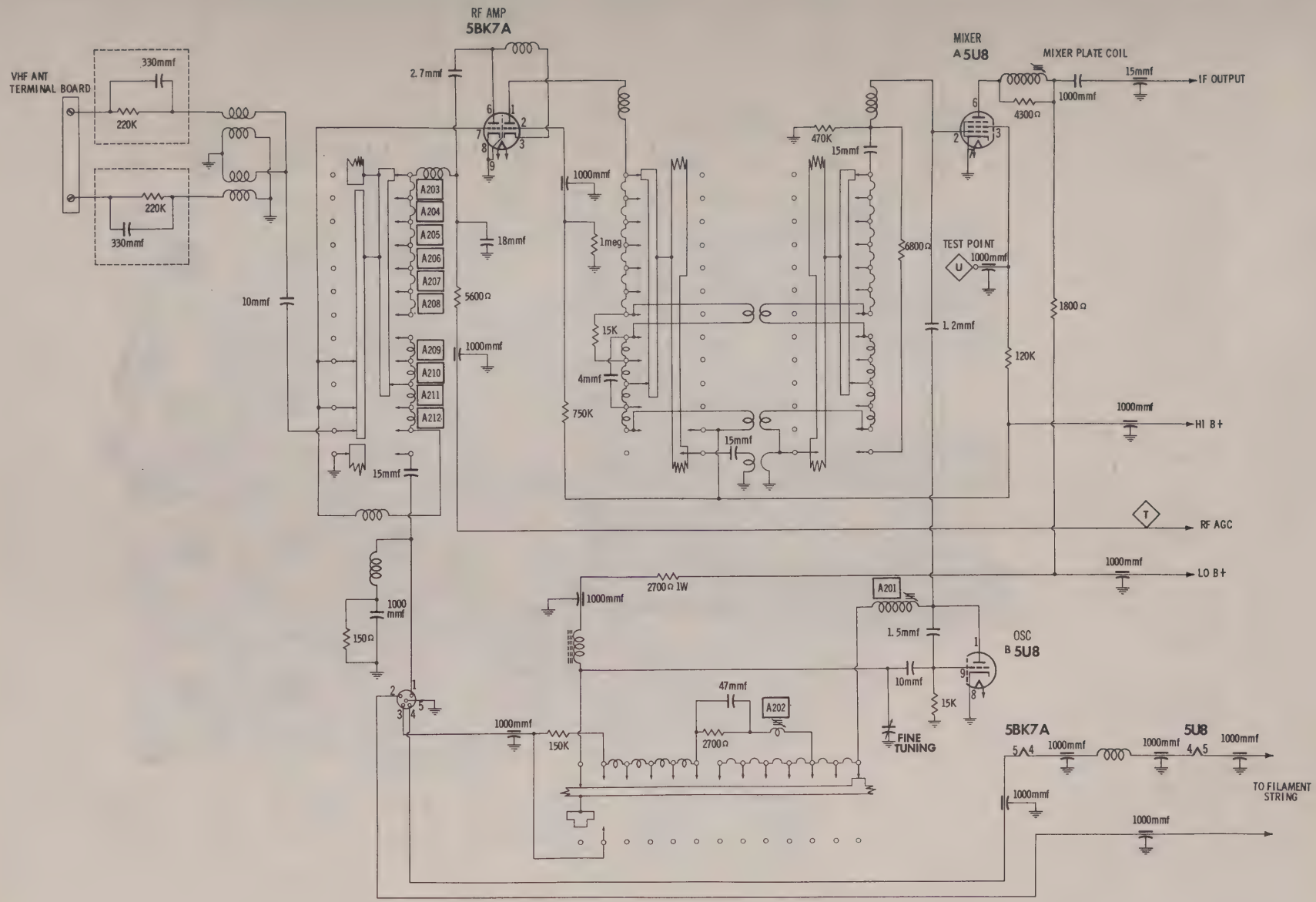
Use an ISOLATION TRANSFORMER to PROTECT the Test Equipment.
The high voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.

VHF OSCILLATOR ALIGNMENT

Set the Fine Tuning to the center of its range. Set the Channel Selector to the highest high band channel (13-7) operating in the area.
Adjust the high band oscillator adjustment slug (A201) for best picture and sound.
Switch Channel Selector to the highest low band channel operating in the area and adjust the low band oscillator adjustment (A202) for best picture and sound. Recheck high band adjustment.

FIG. 201

Continued PAGE 15



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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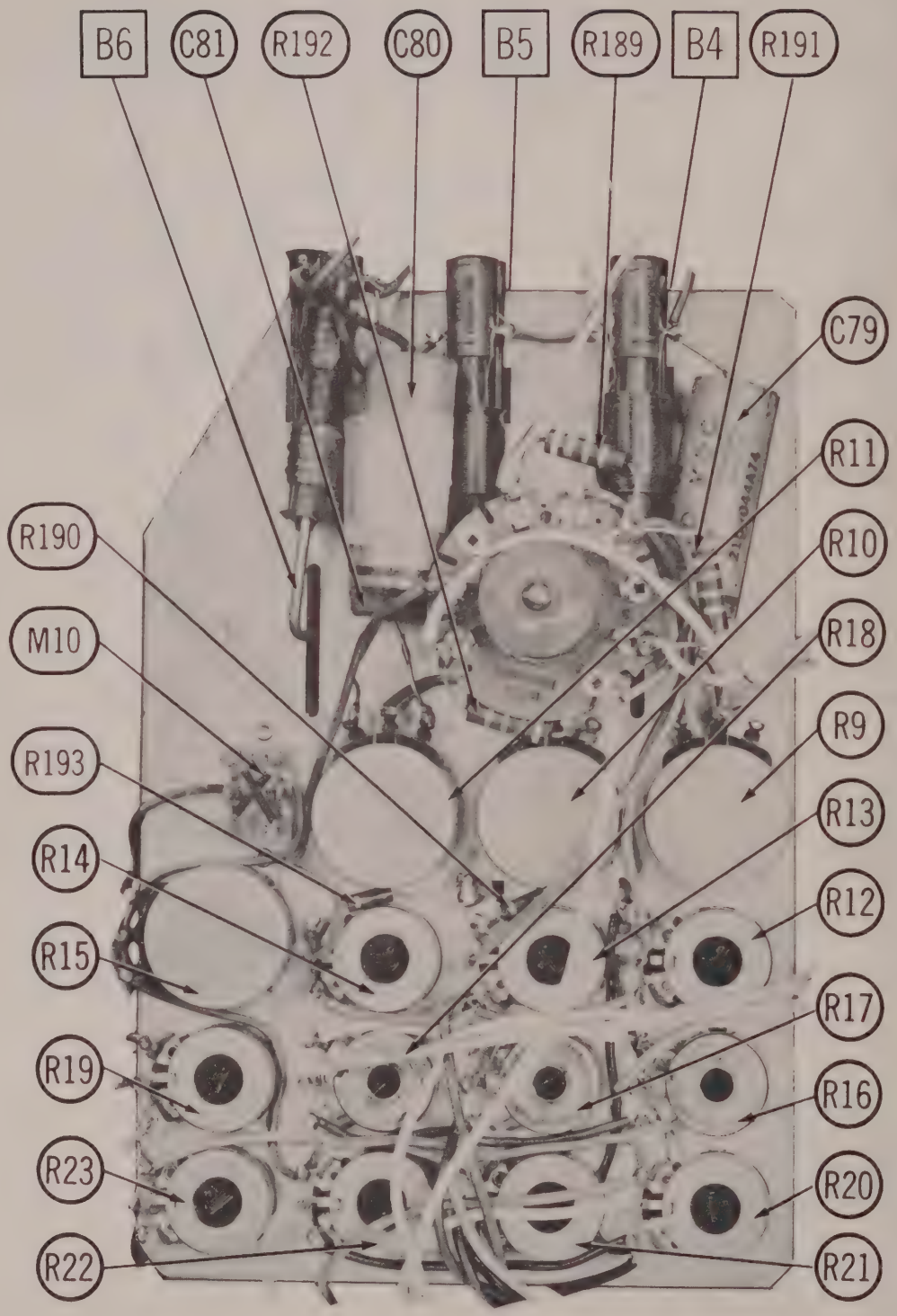
VHF TUNER with UHF provisions 473V008H01



CONVERGENCE PANEL

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

Use an ISOLATION TRANSFORMER to PROTECT the Test Equipment.
The high voltage lead should be securely taped and kept away from the chassis.
Suggested Alignment Tools: A1 – A14, A16 – A21 .... GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545
A15 .....GENERAL CEMENT #9087, 9089
WALSCO #2528

VIDEO IF ALIGNMENT

Connect a clip lead from pin 1 (grid) of the 3BZ6 (V2) to chassis.
Connect a 470mmf capacitor across the input end of the scope leads.
Use only enough sweep generator output to provide a usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.05mfd	High side to pin 8 (grid) of 5AN8 (V4). Low side to chassis.	44MC (10MC Swp)	41.67MC 42.17MC 42.67MC 43.9MC 45.75MC	Any non-interfering channel	Vert. Amp. to point Ⓐ. Low side to chassis.	A1, A2, A3	Preset A1 fully counterclockwise and A2 fully clockwise. Adjust A2 counterclockwise until "kickup" produced in response curve is tuned out of low frequency end of band-pass. Adjust A3 to peak at 43.9MC, then to place 41.67MC and 45.75MC markers at same level. Adjust A1 until the two peaks are equal, A2 counterclockwise to peak at 41.67MC (See Fig. 1). Retouch A1 to place three peaks on same slope as in Fig. 2. Retouch A3 to place all three peaks on same level as in Fig. 3.
2.	"	"	Not used	41.25MC (400∿ Mod)	"	Vert. Amp. to point Ⓑ. Low side to chassis.	A2	Retouch A2 for MINIMUM 400∿ indication on scope.
3.	"	"	44MC (10MC Swp)	41.25MC 42.17MC 45.75MC	"	"		Check for response similar to Fig. 4 within the limits shown.
4.	"	"	"	41.25MC 41.67MC 42.17MC 42.67MC 45.75MC	"	Vert. Amp. to point Ⓐ. Low side to chassis.		Check for response similar to Fig. 5. If the response curves in steps 3 and 4 are not within allowable limits, repeat steps 1, 2, 3 and 4. Remove clip lead from pin 1 of V2.
5.	"	High side to pin 1 (grid) of 1st Video IF (V1). Low side to chassis.	Not used	47.25MC (400∿ AM)	"	Vert. Amp. to point Ⓑ. Low side to chassis.	A4	Connect the negative lead of a 4 volt bias supply to point Ⓒ. Positive to chassis. Connect the negative lead of a 1.5 volt bias supply to point Ⓓ. Positive to chassis. Use high generator output. Adjust A4 for MINIMUM scope indication.
6.	"	"	44MC (10MC Swp)	43MC 45.75MC	"	"	A5, A6	Use only enough sweep generator output to provide a usable pattern on scope. Adjust A5 for maximum gain at 45.75MC marker. Adjust A6 for maximum gain at about mid-band. Retouch A5 to place 45.75MC marker at 50% on curve.
7.	"	"	"	42.17MC	"	Vert. Amp. to point Ⓐ. Low side to chassis.	A7	Adjust for flat response in the chroma region (42.17MC) of response curve. (See Fig. 5).
8.	"	"	"	42.17MC 45.75MC	"	Vert. Amp. to point Ⓑ. Low side to chassis.		Check for response similar to Fig. 4. If not within limits shown, repeat steps 5, 6 and 7.
9.	Direct	High side to ungrounded tube shield floating over Mixer-Osc. tube (V202). Low side to chassis.	"	"	"	"		Adjust sweep generator output to maintain 5 volts peak to peak on scope.
10.	"	"	"	41.25MC 42.17MC 45.75MC	"	Vert. Amp. to point Ⓐ. Low side to chassis.	A8, A9, & Mixer Plate Coil	Adjust A8 for maximum gain at 45.75MC marker and A9 to place 41.25MC marker in trap notch. Adjust Mixer Plate Coil for flat response in the Chroma range. (See Fig. 6).
11.	"	"	Not used	41.25MC (400∿ AM)	"	"		Retouch A9 for MINIMUM 400∿ indication on scope.
12.	"	"	"	47.25MC (400∿ AM)	"	"		Retouch A4 for MINIMUM 400∿ indication on scope.

ALIGNMENT INSTRUCTIONS (cont)

VIDEO AND SUB-CARRIER ALIGNMENT

Connect a clip lead from pin 8 (grid) of the 5AN8 (V4) to chassis.
Set the "Hue" to the center of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
13.	.05mfd	High side to pin 2 (grid) of 5AN8 (V4). Low side to chassis.	3.58MC (Unmod)	Any non-interfering channel	Detector probe to point (E). Common to chassis.	A10	Adjust for MINIMUM deflection.
14.	"	High side to pin 2 (grid) of 5AM8 (V23). Low side to chassis.	"	"	Detector probe to pin 7 (grid) of 12BH7 (V26). Common to chassis.	A11	Set Hue control to the center of its range. Adjust A11 for maximum deflection.
15.	"	"	"	"	Detector probe to pin 2 (grid) of 12BH7 (V26). Common to chassis.	A12	Adjust for maximum deflection.
16.	"	High side to point (F). Low side to chassis.	"	"	DC probe to point (G). Common to chassis.	A13	Connect a clip lead from pin 2 (grid) of 5AM8 (V23) to chassis. Connect a clip lead from point (H) to chassis. Adjust A13 for maximum deflection. Remove clip lead from pin 2 of V23 and chassis.
17.	"	"	"	"	USE SCOPE Vert. Amp. thru 47K to pin 7 (cathode) of 5AM8 (V23). Low side to chassis.	A14	Connect clip lead from point (J) to chassis. Adjust A14 for zero beat on the scope.
18.	"	"	"	" "	USE VTVM Detector probe to point (K). Common to chassis.	A15	Connect a clip lead from pin 7 (grid) of 6AW8A (V22) to chassis. Check that Hue control is at center of its range. Adjust A15 for MINIMUM deflection. Remove clip leads from pin 7 of V22, and chassis. Remove clip lead from point (J) and chassis.
19.	"	High side to pin 7 (grid) of 6AW8A (V22). Low side to chassis.	"	"	DC probe thru 1meg resistor to point (J). Common to chassis.		Retouch A14 if necessary to obtain zero voltage on meter. Remove all clip leads and test equipment.

CHROMA ALIGNMENT

Connect the negative lead of a 6 volt bias supply to point (L). Positive to chassis.
Connect a clip lead from pin 8 (grid) of 5AN8 (V4) to chassis.
Connect a wire from point (M) to chassis. Connect a clip lead from pin 3 (grid) of 5AM8 (V23) to chassis.
Set Color control 3/4 turn from full counterclockwise.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
20.	.01mfd	High side to point (A). Low side to chassis.	Not used	4.5MC (400∿ AM)	Any non-interfering channel	Vert. Amp. thru low capacity probe to point (N). Low side to chassis.	A16	Adjust for MINIMUM scope indication.
21.	1600Ω Carbon Resistor	High side to point (A). Low side to chassis.	3.58MC (7MC Swp)	3.58MC	"	"	A17	Adjust for maximum at 3.58MC marker.
22.	"	"	"	2.9MC	"	"	A18	From full clockwise position, adjust for maximum gain.
23.	"	"	"	2.9MC 4.1MC	"	"	A19	Adjust to place marker at same level as 2.9MC marker.
24.	"	"	"	2.9MC 3.58MC 4.1MC	"	"		Check for response similar to Fig. 7. If necessary, retouch A16 and A19 for desired response. Remove all connections and jumpers.

SOUND IF ALIGNMENT USING TV SIGNAL

Tune the receiver to a TV station and connect an attenuator between the receiver and the antenna so that the signal may be varied from strong to weak.
Set the Quieting control (R7) to the center of its range.
Apply a strong signal to the receiver and adjust A20 for maximum volume. If peaks occur at two different positions that are widely separated, use the one with the slug farthest from chassis. If two peaks occur within a narrow range of adjustment, the signal is not strong enough or the Quieting control is not set in the proper position.
Adjust A21 for maximum volume. If peaks occur at two different positions of the slug, use peak with slug farthest counterclockwise. Reduce the signal to its lowest usable level and recheck adjustments. Using a very weak signal that allows noise to be audible adjust the Quieting control for MINIMUM noise. DO NOT leave the Quieting control at its maximum counterclockwise position.

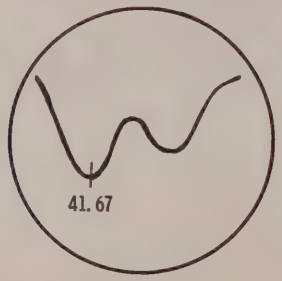


FIG.1

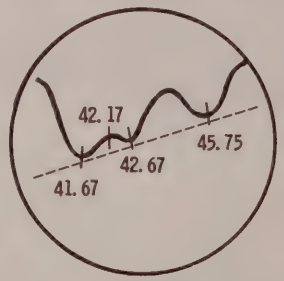


FIG.2

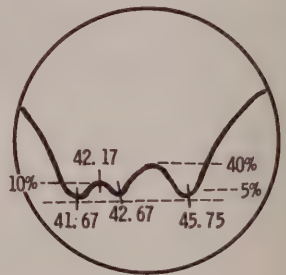


FIG.3

ALIGNMENT INSTRUCTIONS (cont)

SOUND IF ALIGNMENT USING SIGNAL GENERATOR AND VTVM

Connect a clip lead from pin 8 (grid) of the 5AN8 (V4) to chassis.
Connect the negative lead of a 6 volt bias supply to point (L) Positive to chassis.
Set the Quieting control (R7) to the center of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
25.	.001mfd	High side to point (A). Low side to chassis.	4.5MC (400∿ FM 30% 15KC Swp)	Any non-interfering channel	AC probe across Volume control.	A20	Using strong signal, adjust A16 for maximum deflection.
26.	"	"	"	"	"	A21	Using lowest signal level that will produce an indication adjust A21 for maximum deflection.
27.	"	"	4.5MC (400∿ AM 30% Mod)	"	"	Quieting control (R7)	Starting with a very weak signal, increase signal level while rotating the Quieting control back and forth until the level is reached which allows the meter reading to drop to zero with a rise on each side of zero. Adjust the Quieting control for zero at this signal level. Repeat steps 25 and 26. Disconnect all test equipment and tune in the weakest station signal available. If necessary, make very SLIGHT readjustment of the Quieting control. NOTE: Quieting control must not be left at full counterclockwise position.

TUNER ALIGNMENT INSTRUCTIONS LOCATED ON PAGES 6 & 15

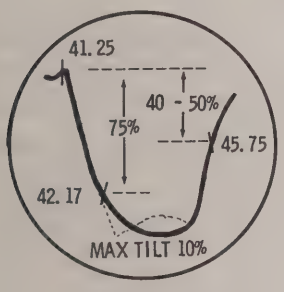


FIG. 4

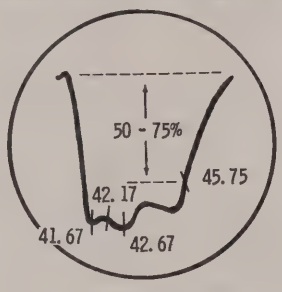


FIG. 5

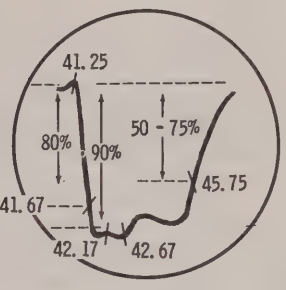


FIG. 6

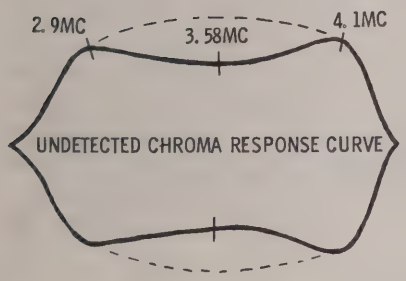


FIG. 7

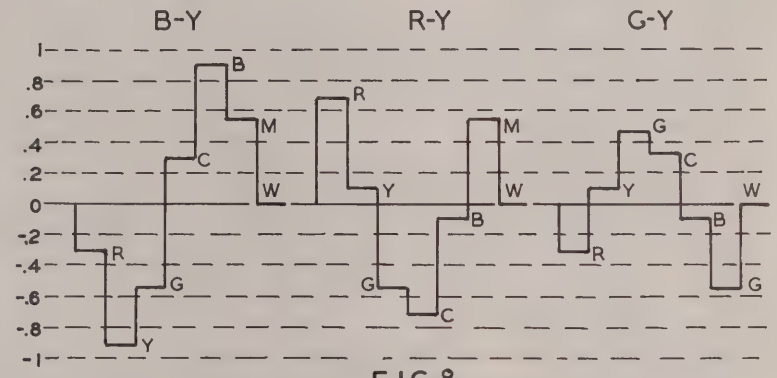


FIG. 8

MISCELLANEOUS ADJUSTMENTS

Suggested Alignment Tools:

B1 ... GENERAL CEMENT #5000, 5003, 5014, 5015, 5016, 8276, 8290
WALSCO #2512, 2515, 2522, 2523, 2525, 2537

B2 .. GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2526, 2543, 2544, 2545

B3 GENERAL CEMENT #8271, 8273, 8275, 8276, 8721, 8722, 9150, 9298, 5003
WALSCO #2516, 2519

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

1. Connect a short clip lead across the Horizontal Frequency coil (L46).
2. Set the Horizontal Hold to the center of its range.
3. Connect the DC probe of the VTVM to pin 7 (grid) of the Horizontal Multibrator (V13) and the common lead to chassis.
4. With the receiver tuned to a TV station, adjust the Horizontal Multivibrator Trimmer (B1) for zero reading on the VTVM. If zero can be approached, but not reached at one extreme of B1, it may be necessary to set the Horizontal Hold SLIGHTLY to one side of mid-range to obtain zero reading on the VTVM.
5. Remove the clip lead from L46.
6. Adjust the Horizontal Frequency slug (B2) for zero reading on the meter and check adjustment by switching off channel and back again. The receiver should pull into sync on all channels. If not, repeat adjustments.
7. Set the Width switch for a raster SLIGHTLY wider than necessary to fill the picture mask horizontally.
8. Remove the 3/4A fuse (M4) and connect a 0 to 1000 ma meter in its place. Turn the set on and tune in a TV station, preferably with a test pattern.
9. Adjust the Horizontal Linearity slug (B3) for MINIMUM current reading on the meter. From this position, turn B3 counterclockwise (not more than six full turns) for best horizontal linearity. The current reading should not exceed 630 ma.

STATIC CONVERGENCE ADJUSTMENTS

1. Adjust the receiver for correct black and white reception. It may be necessary to adjust Focus, Width, High Voltage, Linearity, Height and Centering.
2. Connect a crosshatch pattern generator to the antenna terminals and tune in on the receiver. Make sure that all three color lines are visible.
3. Turn the Blue Screen control counterclockwise until the blue cannot be seen.
4. Observing only a small segment of the screen in the center of the raster, rotate the Red and Green Convergence magnets until the two colors coincide in the center of the screen.
5. Turn up the Blue Screen control and adjust the Blue Convergence magnet and the Blue Beam Positioning magnet until the blue lines coincide with the yellow lines formed by converging the green and red lines. It may be necessary to repeat steps 4 and 5 to achieve best convergence in the center of the screen.

MISCELLANEOUS ADJUSTMENTS (Con't)

PURITY ADJUSTMENTS

1. Loosen the wing nuts holding the yoke in place and slide the yoke toward the back of the receiver as far as possible.
2. If desired, degauss the picture tube.
3. Turn the Blue and Green Screen controls so that only a red raster is present. If the red screen is too weak or is not present at all, follow the procedure outlined under " Red Screen Reference Setting"
4. Adjust the purity ring magnets to place the red field in the center of the screen. Start with the two red tabs together. Spreading the tabs apart increases the strength of the magnetic field and rotating them changes the direction of force. Adjust until the maximum red area appears in the center of the raster. Do not make the field any stronger than necessary.
5. Slide the deflection yoke forward until the position is found which makes the red area as large as possible and tighten the wing nuts.
6. Adjust the Field Neutralizing Coil Amp. control (R15) and the Polarity switch to clear up any impurities in the red field at the outer edges of the screen.
7. If impurities still exist at the outer edges of the screen, attach rim magnets and adjust to clear up any impurities.
8. Turn up the Blue and Green Screen controls to produce a uniform white raster. If any impurities are present, check the adjustment of the Field Neutralizing Coil Amp. control or edge magnets.
9. If a microscope is available that is capable of focusing on the phosphor dots inside the picture tube at the outer edges, it may be used to further improve purity. Focus first on a trio of dots at the center of the screen. If purity is correct, the point of beam impact will be in the center of each dot.
10. If any of the dots in the center seem to be clipped on one side rotate the purity magnets as a whole to center the beams in their respective dots.
11. Examine the dots at the outer edges of the screen and if clipping is observed, correct by moving the yoke backward or forward, or if necessary turning the Field Neutralizing Coil Amp. control.
12. It may be necessary to add clip-on magnets and adjust where clipping is only in an isolated area at the edge of the screen.

HORIZONTAL DYNAMIC CONVERGENCE

1. Connect a crosshatch pattern generator and adjust the Red, Blue and Green Convergence magnets and Blue Beam Positioning magnet for convergence at the center of the screen. Be sure that the centering and linearity is set before starting the dynamic convergence adjustments.
2. Decrease the Blue Screen and Background controls until the blue lines disappear.
3. Observe the center horizontal red and green lines and adjust the Red-Green Horizontal Tilt Balance (R11) for equal displacement between the red and green lines at the right and left ends, the red lines either being above or below the green on both sides of the screen.
4. Adjust the Red-Green Horizontal Amp. Balance (B6) until the red line and the green line are parallel.
5. Repeat steps 3 and 4 if necessary.
6. Observe the vertical red and green lines where they intersect with the center horizontal red and green lines. Adjust the Red-Green Horizontal Tilt (R10) for equal displacement between the red and green vertical lines at the right and left side of the screen, the red line being either to the left of the green at both edges of the screen, or to the right of the green at both edges of the screen.
7. Adjust the Red-Green Horizontal Amp. (B5) until there is equal displacement between the red and green vertical lines across the entire middle portion of the screen from left to right.
8. Repeat steps 6 and 7 if necessary.
9. Increase the Blue Screen and Background controls until the blue lines are visible.
10. Observe the horizontal blue line in the center of the screen. Adjust the Blue Horizontal Tilt control (R9) for equal displacement between the blue lines and the red and green lines at the right and left edges of the screen, the blue lines being either above the red and green on both sides or below on both sides.
11. Adjust the Blue Horizontal Amp. (B4) until the blue horizontal line is parallel to the red and green lines.
12. Repeat steps 10 and 11 if necessary.
13. Adjust the Red, Blue & Green Convergence magnets and the Blue Beam Positioning magnet for convergence at the center of the screen.

VERTICAL DYNAMIC CONVERGENCE

1. Decrease the Brightness and Picture controls until the red lines disappear. Adjust the Blue and Green Screen and Background controls for suitable blue and green lines.
2. Observe a vertical green line in the middle of the screen. Adjust the Green Vertical Tilt control (R17) for equal displacement between the green and blue vertical lines at the top and bottom of the screen, the green line being on the same side of the blue at the top and bottom of the screen.
3. Adjust the Green Vertical Amp. control (R13) until the green line is parallel to the blue line from top to bottom.
4. Repeat steps 2 and 3 if necessary.
5. Increase Brightness and Picture controls until the red lines are visible. Decrease the Green Screen and Background controls until the green lines disappear.
6. Observe the vertical red line in the middle of the screen. Adjust the Red Vertical Tilt control (R18) for equal displacement between the red and blue lines at the top and bottom of the screen, the red line being on the same side of the blue at the top and bottom.
7. Adjust the Red Vertical Amp. control (R14) until the red line is parallel to the blue line from top to bottom.
8. Repeat steps 6 and 7 if necessary.
9. Adjust the Blue Vertical Tilt control (R16) for equal displacement between the blue and red vertical lines at the top and bottom of the screen, the blue line being on the same side of the red at both top and bottom.
10. Adjust Blue Vertical Amp. control (R12) for equal displacement between the red and blue lines from top to bottom of the screen, the blue being on the same side of the red all the way across the screen.
11. Repeat steps 9 and 10 if necessary.
12. Increase the Green Screen and Background controls until the green lines appear.
13. Adjust the Red, Blue and Green Convergence magnets and the Blue Beam Positioning magnet for convergence at the center of the screen. Touch-up the horizontal and vertical convergence if necessary.

COLOR PHASING

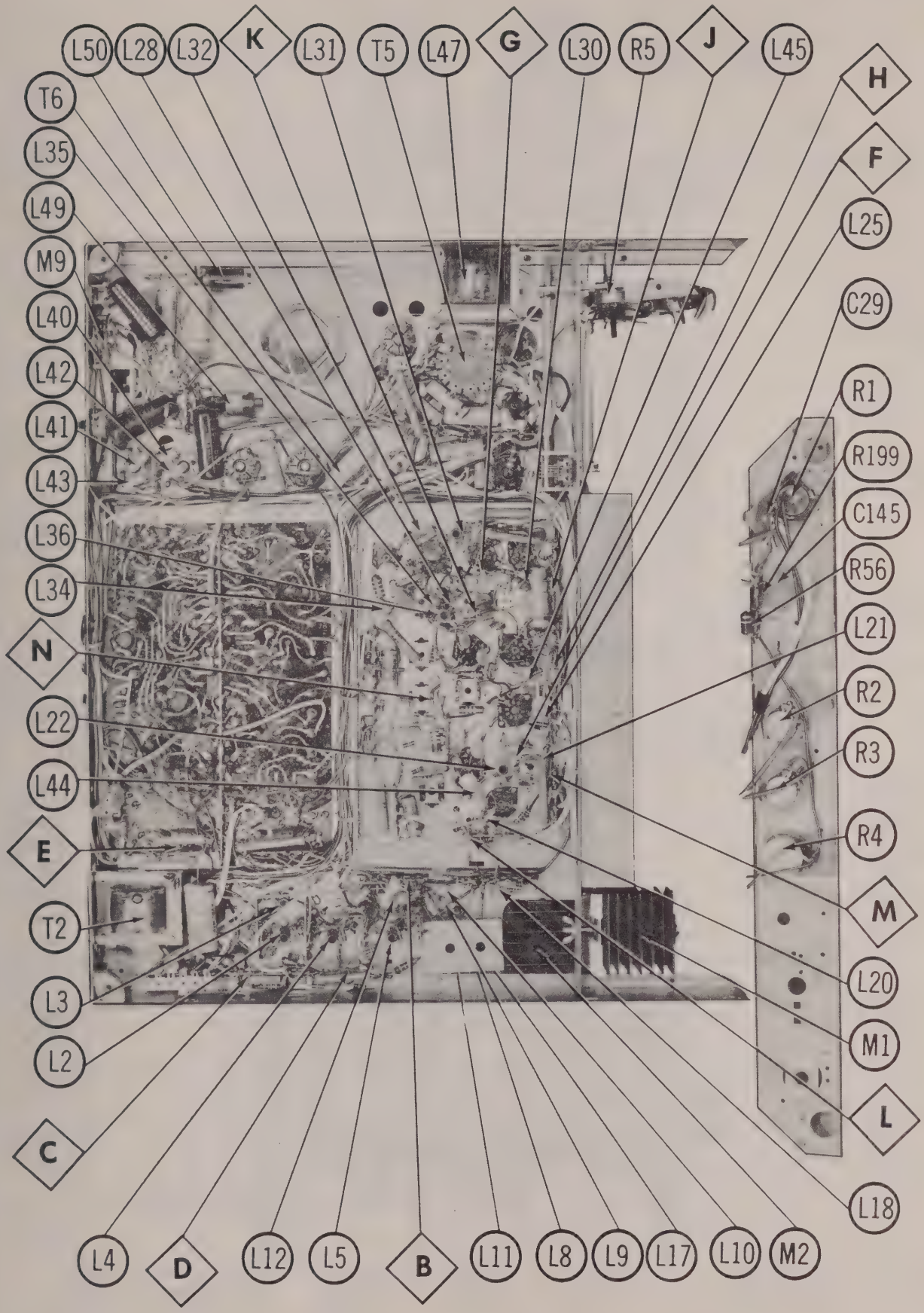
Connect a color bar generator to the antenna terminals. If the generator has a sound carrier, adjust the Fine Tuning so that the sound carrier is trapped out.
Connect the vertical amplifier of a scope to pin 2 (red grid) of the picture tube. Connect the low side of the scope to chassis.
Set the Color control (R5) 3/4 turn from full counterclockwise. Set the Hue adjustment (M14) to the center of its range.
Adjust A17 for waveform similar to R-Y shown in Fig. 8. (SLIGHT adjustment of the Color control may be necessary.)
Move the scope connection to the blue grid (pin 12) of the picture tube. Adjust A12 for waveform similar to B-Y shown in Fig. 8.
Move the scope connection to the green grid (pin 6) of the picture tube. Check for waveform similar to G-Y shown in Fig. 8.

RED SCREEN REFERENCE SETTING

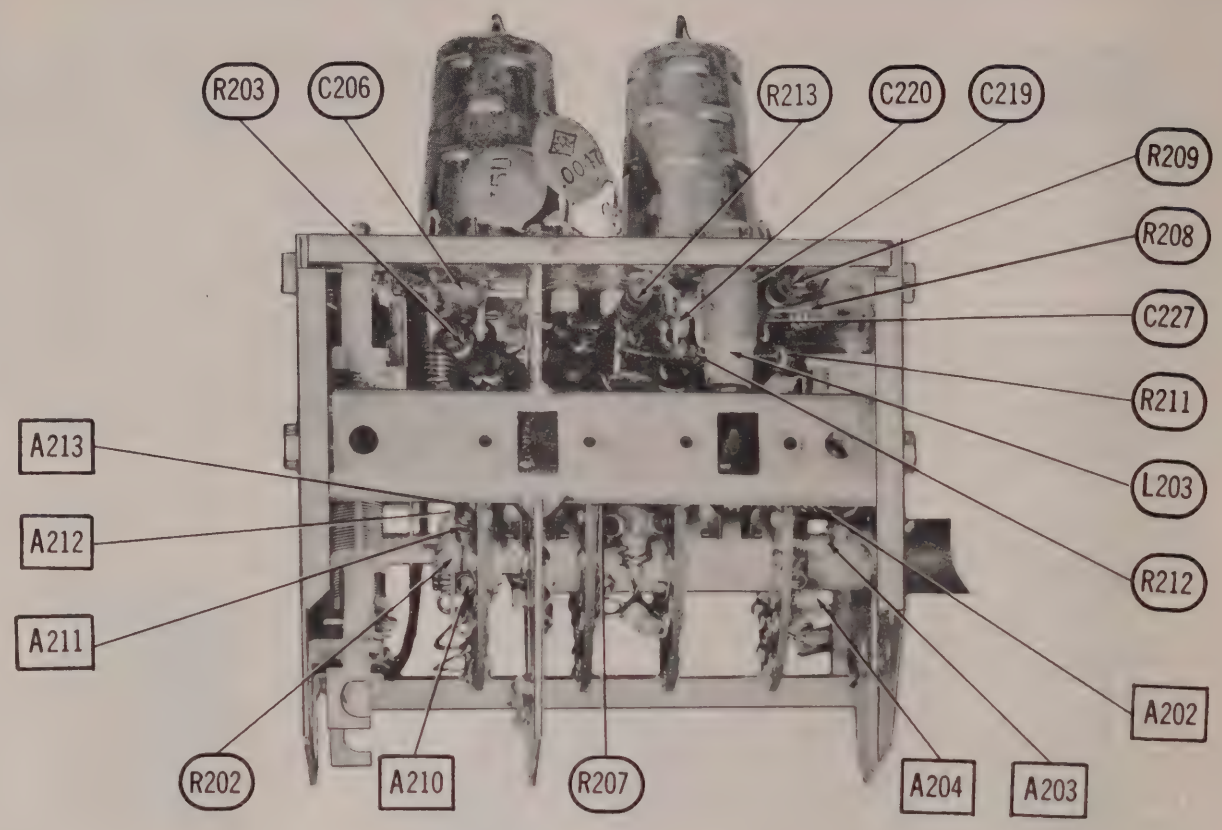
The Red Screen control has been preset at the factory and under normal conditions should not be touched. However, if the picture tube or components effecting the red gun aperture setting are replaced, the Red Screen control should be adjusted before proceding with the adjustment of the Green and Blue Screen and Background controls.
To adjust the Red Screen control turn the Blue and Green Screen and Background controls fully counterclockwise. Connect the positive lead of a 4mfd capacitor to point ⏚ . Negative lead to chassis.
Connect the DC probe of a VTVM to pin 2 of the picture tube. Common to pin 4 of the picture tube. Use negative 100 volt scale. (CAUTION: Meter is 260 volts above chassis. DO NOT touch meter while set is on).
Turn the set on and tune to signal of normal strength. Adjust the Brightness until the meter reads -90 volts. Adjust the Red Screen until the red raster just disappears. Turn the receiver off and disconnect the 4mfd capacitor and VTVM. Do not make any further adjustments of the Red Screen once this procedure has been completed. Procede with the "Gray Scale Adjustments".

GRAY SCALE ADJUSTMENTS

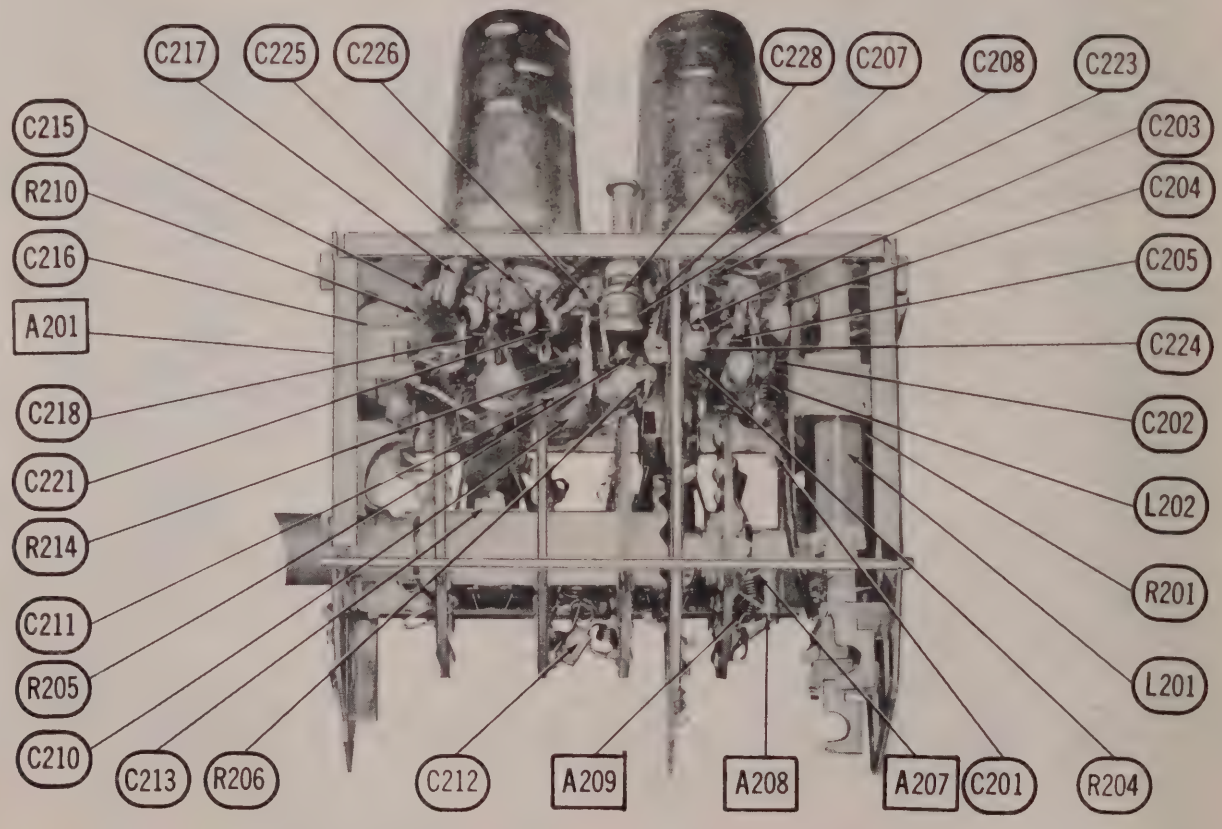
Make sure that no light falls on the face of the picture tube because black and white balance cannot be adjusted under high ambient light conditions. Set the Channel Selector to an air signal. Set the Brightness and Contrast controls for a low contrast red raster. Set Green and Blue Screen and Background controls fully counterclockwise. Turn the Green Screen 3/4 turn from full counterclockwise. Advance Green Background control until the low brightness areas of the picture are a dull yellow. Increase Brightness control for bright raster without causing blooming. If the raster color changes toward orange at high brightness, decrease the Green Screen control SLIGHTLY and readjust the Green Background control for yellow at low levels. If the color changes toward green, increase the Background control setting and readjust the Green Screen control for yellow at low levels. Repeat until yellow is obtained throughout the brightness range.
Advance the Blue Screen control to 3/4 turn from full counterclockwise and adjust the Blue Background control until the low levels are gray. Increase the Brightness control just short of the blooming stage. If the picture changes toward yellowish whites at high brightness, decrease the Blue Screen control and readjust the Blue Background for gray at low levels. Reduce the Brightness and check for tracking. Repeat until tracking is correct. If the raster changes toward bluish white at high brightness, increase the Blue Screen control and readjust the Blue Background control for gray at low levels. Reduce the Brightness and check for tracking. Repeat until tracking is correct. After this is done, look away from the set for a few minutes and recheck tracking as the eye may become accustomed to the near white shade after a prolonged time.



CHASSIS BOTTOM VIEW - INDUCTOR & ALIGNMENT IDENTIFICATION



TUNER 470V006H01 - LEFT SIDE



TUNER 470V006H01 - RIGHT SIDE

TUNER ALIGNMENT INSTRUCTIONS (cont)

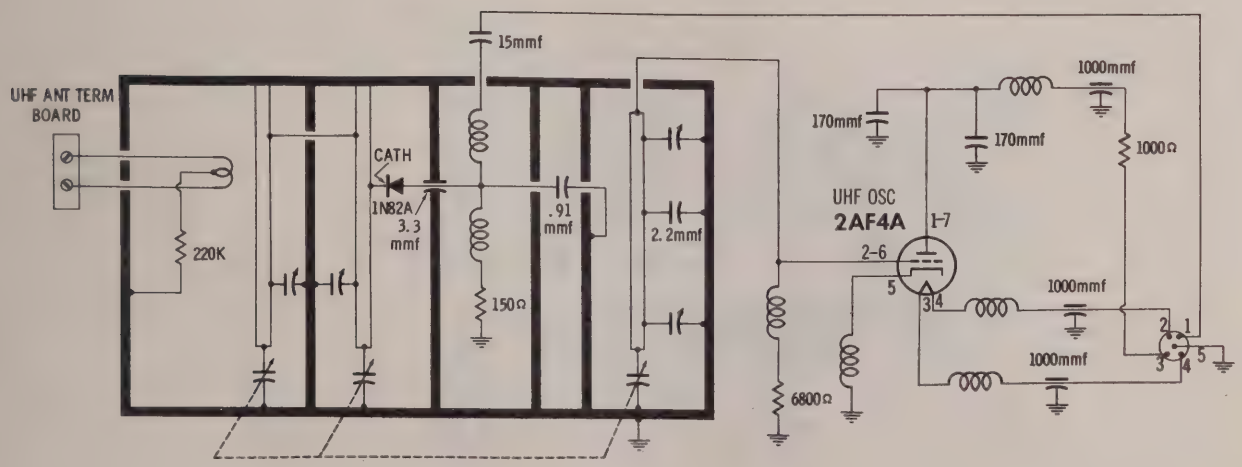
VHF RF AND MIXER ALIGNMENT

Connect the negative lead of a 2.5 volt bias supply to point Ⓣ . Positive to chassis.
Detune Mixer Plate Coil to eliminate distortion of the response curve. Loosely couple marker generator to sweep cable and adjust marker output so that marker is just visible as excessive marker amplitude will result in distortion of the response curve.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Two 120Ω Carbon Resistors	Across VHF antenna terminals with 120Ω in each lead.	207MC	205.25MC 209.75MC	12	Vert. Amp. thru 10K to point Ⓤ . Low side to chassis.	A203	Adjust for maximum gain and symmetry of response similar to Fig. 201 with markers as shown.
2.	"	"	201MC	199.25MC 203.75MC	11	"	A204	"
3.	"	"	195MC	193.25MC 197.75MC	10	"	A205	"
4.	"	"	189MC	187.25MC 191.75MC	9	"	A206	"
5.	"	"	183MC	181.25MC 185.75MC	8	"	A207	"
6.	"	"	177MC	175.25MC 179.75MC	7	"	A208	"
7.	"	"	85MC	83.25MC 87.75MC	6	"	A209	"
8.	"	"	79MC	77.25MC 81.75MC	5	"	A210	"
9.	"	"	69MC	67.25MC 71.75MC	4	"	A211	"
10.	"	"	63MC	61.25MC 65.75MC	3	"	A212	"
11.	"	"	57MC	55.25MC 59.75MC	2	"	A213	Adjust for maximum gain and symmetry of response similar to Fig. 201 with markers as shown. Readjust Mixer Plate Coil as outlined under "Video IF Alignment".

UHF TUNER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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UHF TUNER 474V008H01

TUNER PARTS LIST AND DESCRIPTIONS

470V006H01

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	4BQ7A	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	5AT8	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	Westinghouse PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	12					C10Q12C	CNO-412	5TCC-Q12S *	NPO
C202	47			N750-DI 47	DTN-47	C10Q47U	CN7-447	5TCU-Q47	N750
C203	4.7			NPO-DI 4.7	DTZ-4R7	HVA16V47	CNO-547	10GAB-V47	10%
C204	1.5				DTZ-1R5	C10V15C	CNO-515	5TCCB-V15	
C205	3			NPO-DI 3	D6-030	C10V3C		5TCCB-V3S *	
C206	800			BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C207	800			BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C208	800			BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C209	1000			EF-001	MFT-1000			503C-D1	
C210	59							5TCU-Q59S 10%*	N750 10%
C211	59							5TCU-Q59S 10%*	N750 10%
C212	1.8							5TCCB-V18S *	
C213	1.2							5TCCB-V12S *	
C214	.5-3				829-3		CT565A		
C215	6.8			NPO-DI 6.8	DTZ-6R8	C10V68C	CNO-568	5TCCB-V68	NPO
C216	10			BPD-000001	DD-100	L10Q1	CNO-410	5GA-Q1	
C217	1.5			NPO-SI 1.5	DTZ-1R5	CTA6V15C	ZT-5515	5TCCB-V15	
C218	.39								
C219	1.5			NPO-SI 1.5	DTZ-1R5	C10V15C	CNO-515	5TCCB-V15	NPO
C220	15				TCA-15				N330
C221	800			BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C222	1000			EF-001	MFT-1000			503C-D1	
C223	800			BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C224	1000			EF-001	MFT-1000			503C-D1	
C225	800			BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C226	800			BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C227	800			BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C228	.5-3				829-3		CT565A		

* Not normally in distributors stock. Available through distributor on order to manufacturer.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

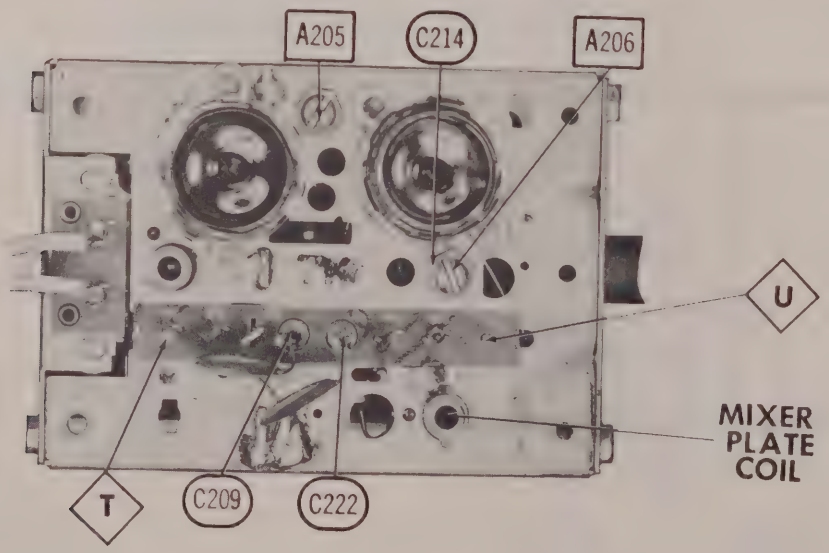
ITEM No.	RATING		Westinghouse PART No.	NOTES
	OHMS	WATT		
R201	220K			
R202	4700Ω			
R203	10K			
R204	1.5meg			
R205	1meg			
R206	1000Ω			
R207	15K			

ITEM No.	RATING		Westinghouse PART No.	NOTES
	OHMS	WATT		
R208	33K			
R209	100K			
R210	15K			
R211	4700Ω			
R212	4300Ω 5%			
R213	1800Ω			

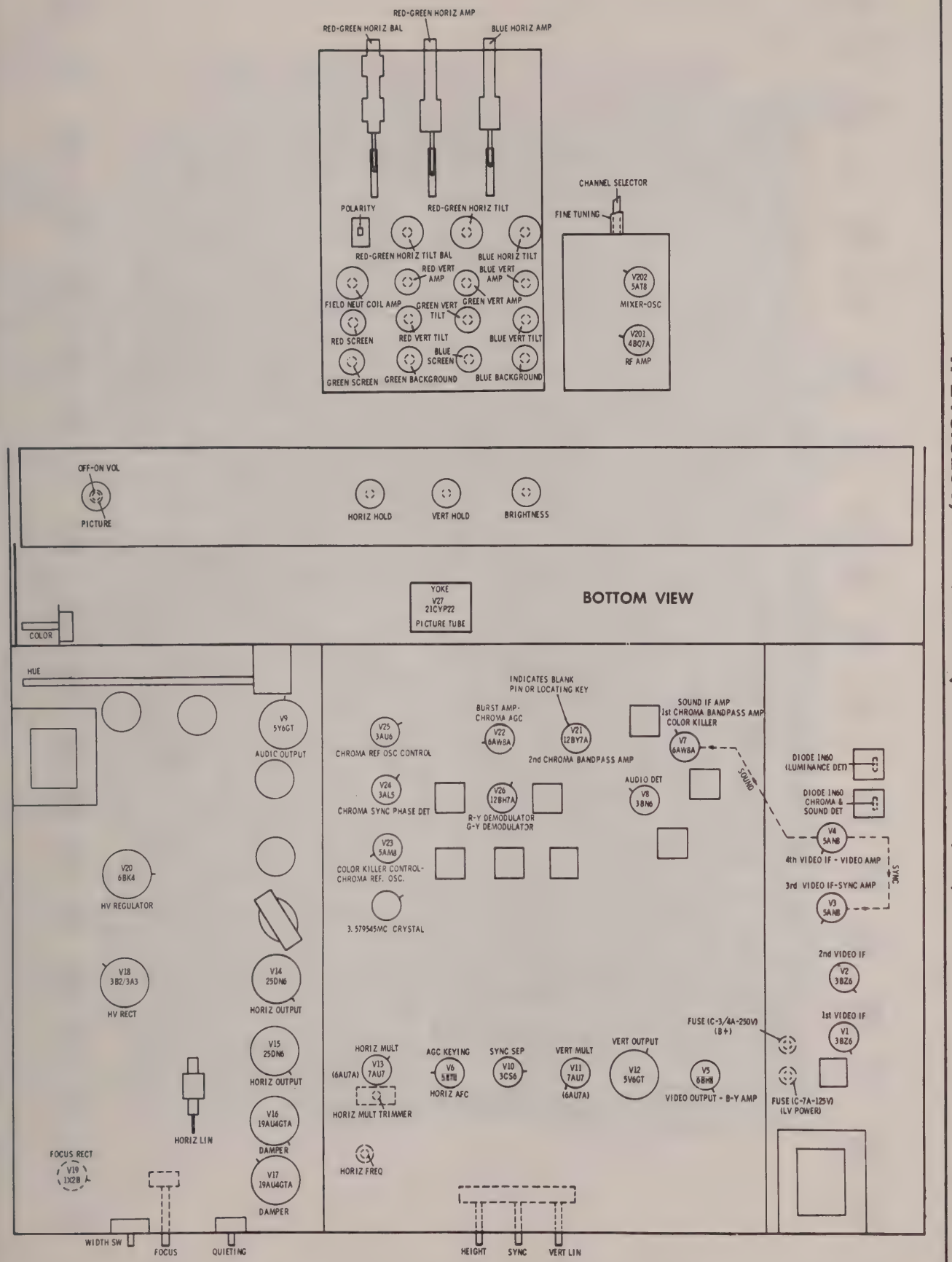
COILS (RF-IF)

ITEM No.	USE	Westinghouse PART No.	NOTES
L201	Ant. Trans.	690V007H08	Includes rear plate assy.

ITEM No.	USE	Westinghouse PART No.	NOTES
L202	IF Trap	690V007H03	
L203	Mixer Plate	690V007H09	



TUNER 470V006H01 TOP VIEW

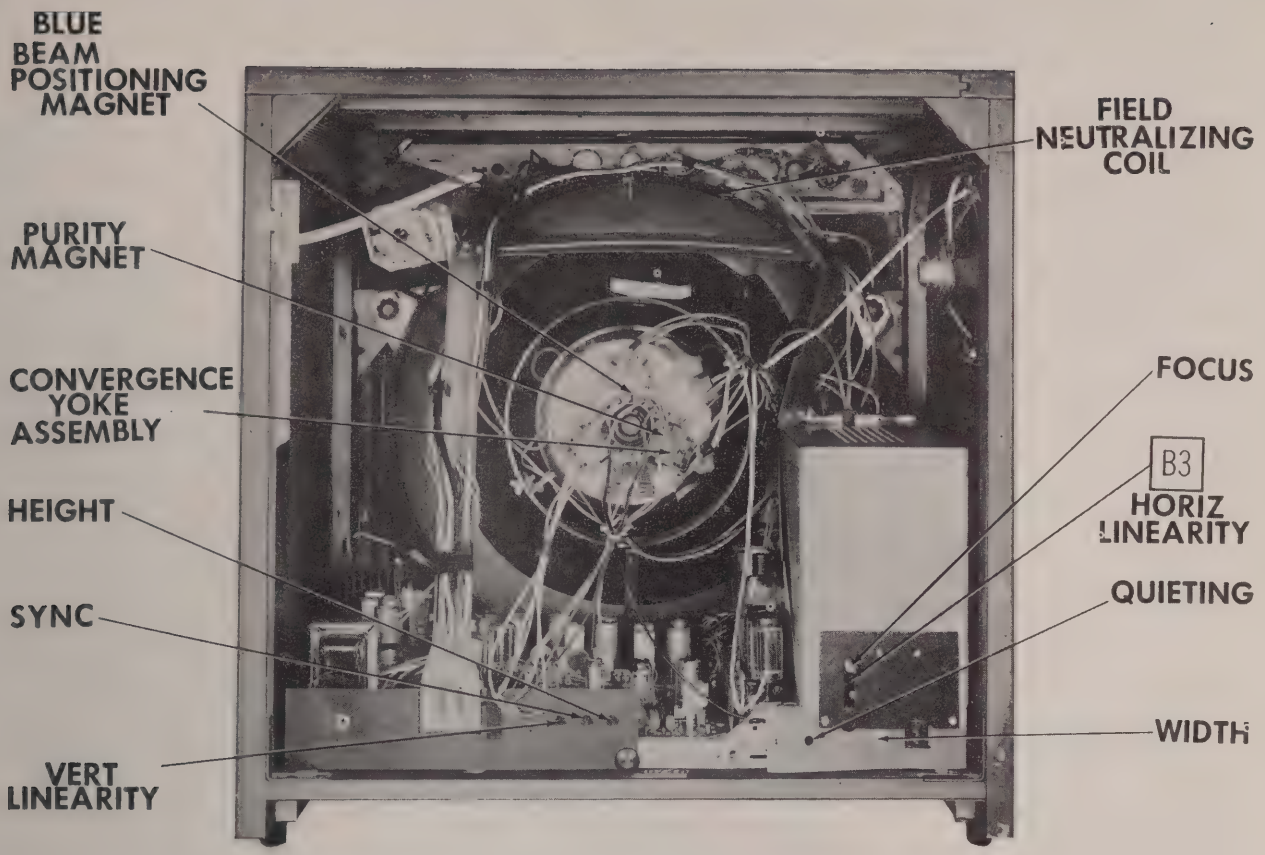


TUBE PLACEMENT CHART

A Howard W. Sams CIRCUITRACE® Photo

PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



CABINET—REAR VIEW

DISASSEMBLY INSTRUCTIONS

SAFETY GLASS REMOVAL

1. Remove 7 push-on type knobs from the front.
2. Remove 2 metal screws holding front escutcheon.
3. Remove 2 metal screws located at top right and left side corners.
4. Tilt metal trim panels out at the top and clear hook to remove.
5. Remove 3 metal screws holding safety glass retainer at top.
6. Tilt glass out at the top and lift to remove.

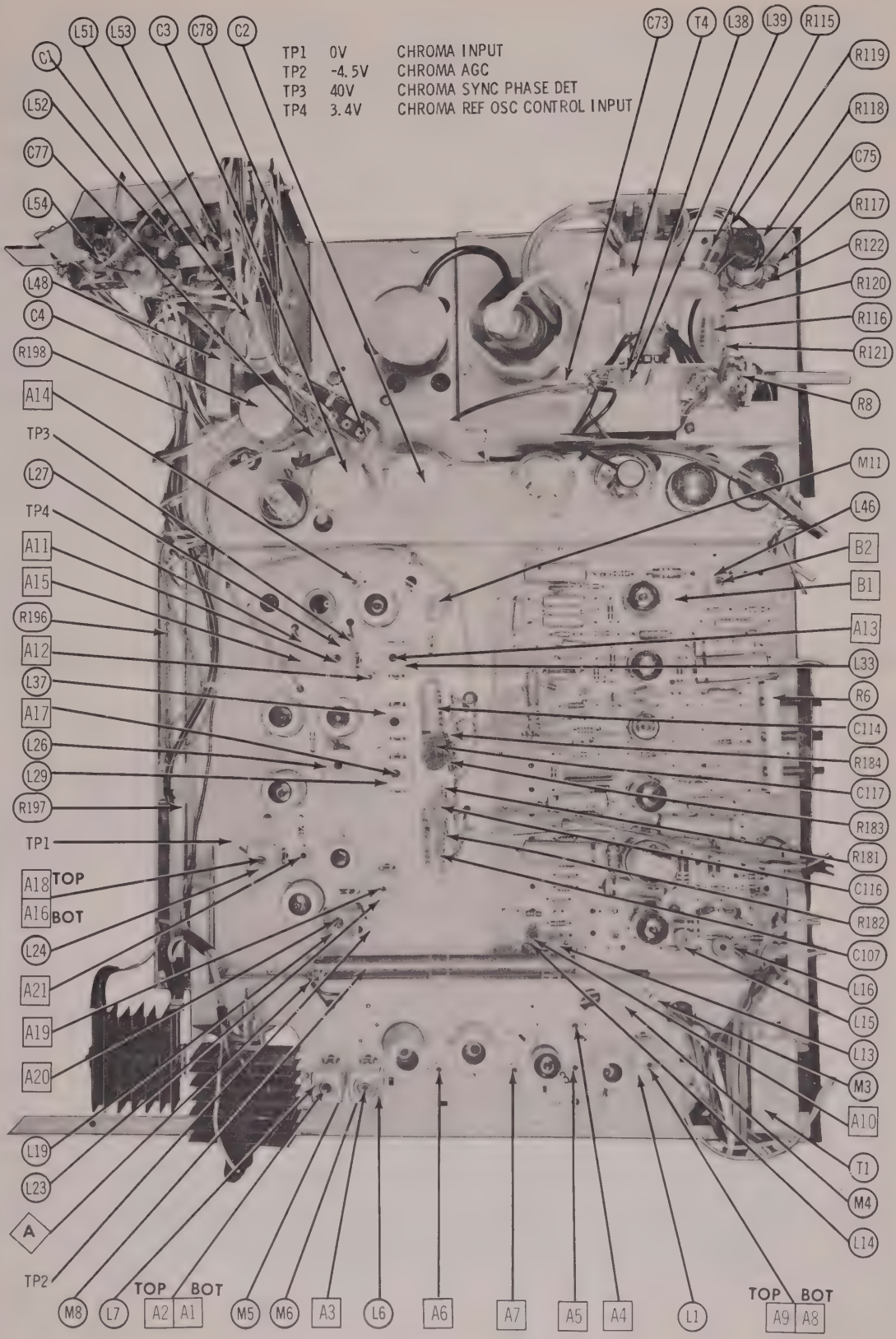
CABINET TOP REMOVAL

1. Remove 2 wood screws holding metal angle brackets to cabinet.
2. Remove 2 wood screws holding wooden support blocks to cabinet.
3. Remove the cabinet top.

CHASSIS REMOVAL

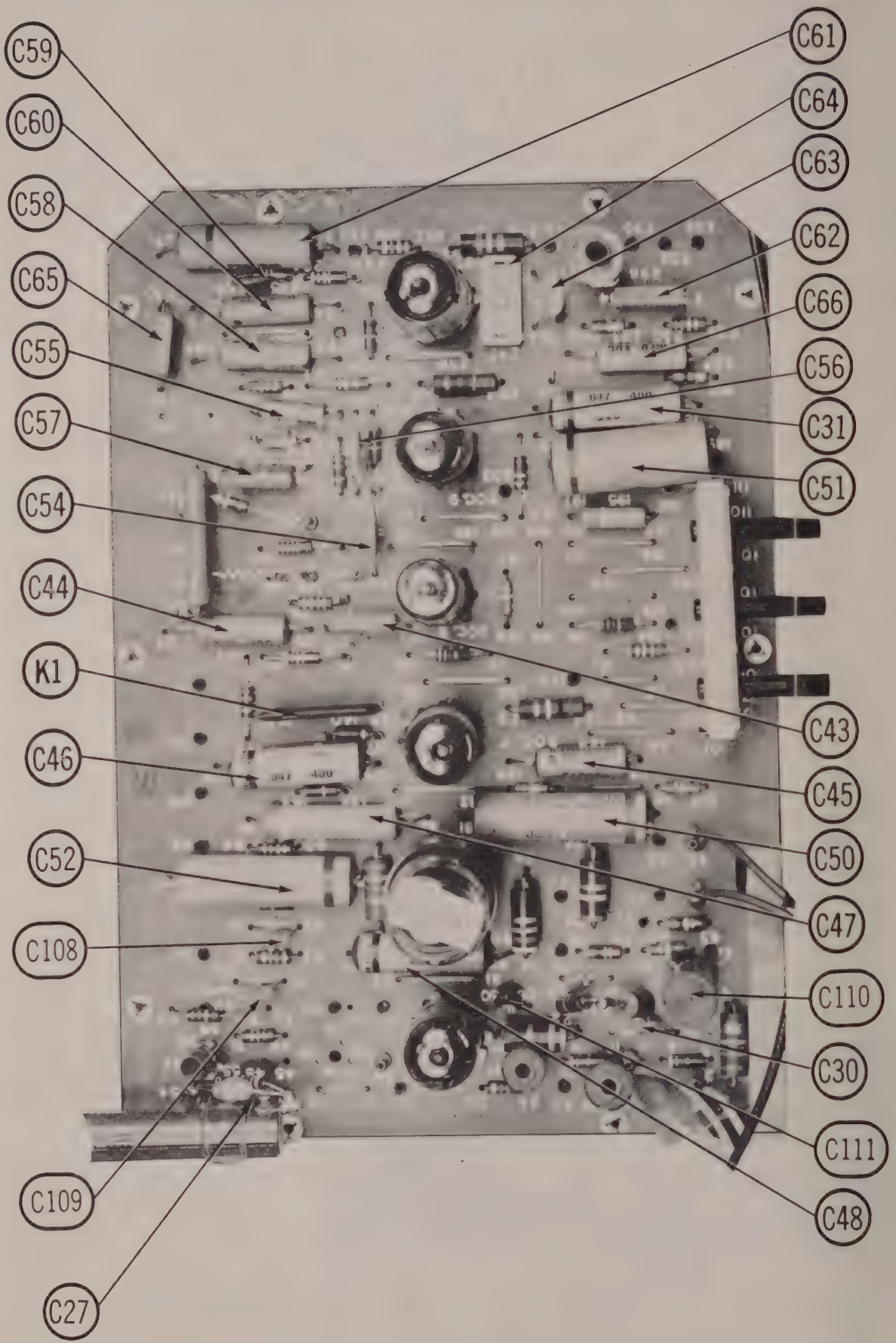
1. Remove 7 push-on type knobs from the front.
2. Remove 2 side push-on type knobs and their metal extension shafts.
3. Remove 8 wood screws holding rear cover. Remove rear cover.
4. Remove 2 metal screws holding front control escutcheon.
5. Remove 3 metal screws holding front control panel to cabinet bracket.
6. Remove speaker leads. Remove 2 wood screws holding antenna terminal board.
7. Remove 6 bottom chassis bolts.
8. Remove 2 bolts holding picture tube support brackets to cabinet.
9. Remove chassis.

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



CHASSIS TOP VIEW

WESTINGHOUSE MODELS H-21CT258, H-21CT259,
H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)



PRINTED BOARD - CAPACITOR IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	1st Video IF Amp.	3BZ6	
V2	2nd Video IF Amp.	3BZ6	
V3	3rd Video IF Amp. - Sync Amp.	5AN8	
V4	4th Video IF Amp. - Video Amp.	5AN8	
V5	Video Output - B-Y Amp.	6BH8	
V6	AGC Keying-Horiz. AFC	5BT8	
V7	Sound IF Amp. - 1st Chroma Bandpass Amp. - Color Killer	6AW8A	
V8	Audio Det.	3BN6	
V9	Audio Output	5V6GT	
V10	Sync Sep.	3CS6	
V11	Vert. Mult.	7AU7	6AU7A *
V12	Vert. Output	5V6GT	
V13	Horiz. Mult.	7AU7	6AU7A *
V14	Horiz. Output	25DN6	
V15	Horiz. Output	25DN6	
V16	Damper	19AU4GTA	
V17	Damper	19AU4GTA	
V18	HV Rectifier	3A3	3B2/3A3*
V19	Focus Rectifier	1X2B	
V20	HV Regulator	6BK4	
V21	2nd Chroma Bandpass Amp.	12BY7A	
V22	Burst Amp. -Chroma AGC	6AW8A	
V23	Color Killer Control-Chroma Ref. Osc.	5AM8	
V24	Chroma Sync-Phase Det.	3AL5	
V25	Chroma Ref. Osc. Control	3AU6	
V26	R-Y Demodulator - G-Y Demodulator	12BH7A	

* Alternate.

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	Westinghouse PART No.	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V27	21CYP22		21CYP22	21CYP22	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Westinghouse PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1	500	200	218V003H01	AFHS2-30-75	XB0252			TVLS-1490 *	
C2	320	350	218V005H01	AFHSI-43-80		FP227.7 TC69		TVLS-1645 *	
C3A	▲200	350	218V004H01	AFH4-56-88				TVLS-4607.4*	
B	▲4	50							
C	20	25							
D	■10	350							
C4A	▲100	350	218V006H01	AFH4-57-55		FP342.2 TC69		TVLS-4607.2*	
B	50	25							
C	■4	350							
D	▲50	50							

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	Westinghouse PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-247	5HK-D47	
C6	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-247	5HK-D47	
C7	.047	400		215V054A73	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C8	.22	400		210V052A24	P488N-22		CUB4P22	GEM-4022	4TM-P22	
C9	.1	400		210V051A04	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C10	.022	400		210V052A23	P488N-022	DD-203	CUB4S22	GEM-4122	4TM-S22	
C11	1000			213V011A02	1469-001		1R5D1	MCB255	MS-21	
C12	680			215V116A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C13	680			215V116A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C14	.1	400		210V051A04	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C15	2.2				NPO-SI 2.2	TCZ-2R2	CTA6V22C	CNO-522	5TCCB-V22	
C16	47				SI 47	D6-470	LT6Q47	CNO-447	5GA-Q47	
C17	680			215V116A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C18	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-247	5HK-D47	
C19	680			215V116A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C20	680			215V116A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C21	800			215V300H18	BPD-0008	DD-801	L10T8	B-382	5GA-T8	
C22	680			215V116A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C23	1000			215V111A02	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C24	680			215V116A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C25	4.7			217V004A79	NPO-SI 47	TCZ-4R7	C10V47C	CNO-547	5TCCB-V47	
C26	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-247	5HK-D47	
C27	330			213V013A31	1469-00033	DD-331	5R5T33		MS-333	
C28	.47	400		210V054A74	P488N-47		CUB4P47	GEM-4047	4TM-P47	
C29	1000	1400		215V101A02	HVD-15-1000		HVB16D1	2HV-210	20HKB-D1	
C30	220		10%	215V300H41	DI 220	D6-221	L10T22	JL-322	5GA-T22S 10% *	
C31	.047	400		210V054A73	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C32	22		NPO 10%	215V300H22	NPO-DI 22	TCZ-22	C10Q22C	CNO-422	5TCC-Q22S 10% *	
C33	4.7		5%	217V004A79		TCZ-4R7		CNO-547	5TCCB-V47S 5%*	
C34	10000			215V111A03	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C35	10000			215V111A03	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C36	5.6		5%	217V005A69					5TCCB-V56S 5%*	
C37	2.2		NPO ±.25mmf	215V122A29		TCZ-2R2		CNO-522	5TCCB-V22S ±.25mmf*	
C38	1500			215V101A52	BPD-0015	DD-152	BYA10D15	B-215	5HK-D15	
C39	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-247	5HK-D47	
C40	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-247	5HK-D47	
C41	.022	400		210V052A23	P488N-022	DD-203	CUB4S22	GEM-4122	4TM-S22	
C42	.0047	600		210V064A72	P688N-0047	DD-472	CUB6D47	GEM-6247	6TM-S47	
C43	270		10%	213V012A71	1469-00027	TCZ-270	5R5T27		MS-327	
C44	.01	400		210V051A03	P488N-01	DD-103	CUB4S1	GEM-411	4TM-S1	
C45	.0047	600		210V110H05	P688N-0047	DD-472	CUB6D47	GEM-6247	6TM-D47	
C46	.047	400		210V054A73	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA Westinghouse PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C47	.033	400		210V053A33	P488N-033	DF-303	CUB5S3	GEM-4133	4TM-S33	
C48	.033	600		210V063A33	P688N-033	DF-303	CUB6S3	GEM-6133	6TM-S33	
C49	10000	1400		215V20A03			HVE16S	2EV-110	20HKD-SI	
C50	.22	400		210V053A24	P488N-22		CUB4P22	GEM-4022	4TM-P22	
C51	.22	400		210V042A24	P488N-22		CUB4P22	GEM-4022	4TM-P22	
C52	.22	400		210V042A24	P488N-22		CUB4P22	GEM-4022	4TM-P22	
C53	.1	400		210V051A04	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C54	82		N220 10%	215V18A30						
C55	390			213V13AR	1469-00039	D6-391	5R5T39		M5-339	
C56	68		N220 10%	215V18A80						
C57	680		10%	215V18AR	1469-00066	D6-681	1R5T68		M5-368	
C58	.01	400		210V051A03	P488N-01	DD-103	CUB4S1	GEM-411	4TM-S1	
C59	4700			210V104A72	BPD-0047	DD-472	BYA10D47	B-347	5EK-D47	
C60	.01	400		210V051A03	P488N-01	DD-103	CUB4S1	GEM-411	4TM-S1	
C61	.1	200		210V041A04	P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C62	1000		10%	213V11H03	1469-001		1R5D1	MCB256	M5-21	
C63	68		N220 10%	215V18A80						
C64	19-160			217V50H01						
C65	390		10%	213V13AR	1469-00039	D6-391	5R5T39		M5-339	
C66	.01	400		210V051A03	P488N-01	DD-103	CUB4S1	GEM-411	4TM-S1	
C67	.1	400		210V051A04	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C68	.1	400		210V051A04	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C69	.1	400		210V051A04	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C70	.15	600		210V056A54	P688N-15		CUB6P15	GEM-6015	6TM-P15	
C71	.047	400		210V054A73	P488N-047	DF-503	CUB4P47	GEM-4147	4TM-S47	
C72	.022	600		210V062A23	P688N-022	DD-203	CUB6S22	GEM-6122	6TM-S22	
C73	100	5000		215V300H24	HVD-50-100	DD60-101	HVB50T1	6HV-310	60HKB-T1	
C74	240	3000	5%		V-1H151-1	UV-501	TV-207	MMU200TS	HV20035U	3DDK-T5
C75	500	12500		210V052A23	P688N-022	DD-203	CUB6S22	GEM-6122	6TM-S22	
C76	.022	600								
C77	.82	400		210V11H01						
C78	.82	400		210V11H01						
C79	.47	400		210V044A74	P488N-47		CUB4P47	GEM-4047	4TM-P47	
C80	.47	400		210V044A74	P488N-47		CUB4P47	GEM-4047	4TM-P47	
C81	.47	400		210V044A74	P488N-47		CUB4P47	GEM-4047	4TM-P47	
C82	120		10%	215V11A21	1469-00012	TCZ-120	22R5T12	CNO-312	M5-312	
C83	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5GA-S1	
C84	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5GA-S1	
C85	1200			213V04A22	BPD-0012	DD-122	LJ0D12		M5-312	
C86	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5EK-S1	
C87	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C88	1000			215V11A02	BPD-001	DD-102	BYA10D1M	B-210	5HK-D1	
C89	4700			215V104A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C90	4700			215V104A73	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C91	.047	400		210V054A73	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C92	4700			215V104A72	BPD-0047	DD-472	BYA10D47	B-347	5EK-D47	
C93	1000	1400		215V10LA02	HVD-15-1000		HVB20D1	2EV-210	20HKB-D1	
C94	3.3		NPO	215V123A39	NPO-SI 3.3	TCZ-3R3	C10V33C	CNO-533	30HKB-V33	
C95	100		N150	215V10A01						
C96	1000	1400		215V10LA02	HVD-15-1000		HVB20DE	2EV-210	20HKB-DI	
C97	68			213V06A80	1469-000068	TCZ-68	22R5Q68	CNO-468	M5-468	
C98	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5EK-S1	
C99	68		10%	213V06A80	1469-000068	TCZ-68	22R5Q68	CNO-468	M5-468	
C100	1000	1400		215V10LA02	HVD-15-1000		HVB20DI	2EV-210	30HKB-DI	
C101	3.9		NPO ± .25mmf	215V123A39					2TM-P33S *	
C102	.33	200		210V043A34	P288N-33				GEM-2033	
C103	9-7			217V503H01						
C104	560		10%	215V156H23	1469-00056	D6-561	1R5T56		M5-356	
C105	4700		10%	215V104A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C106	22		10%		1469-000022	TCZ-22	22R5J22	CNO-422	M5-422	①
C107	.1	400		210V051A04	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C108	8.2		NPO ± .5mmf	215V300H10					5TCCB-V82S ± .5mmf *	
C109	18		NPO 10%	215V12A80	NPO-SI 18	TCZ-18	C10Q18C	CNO-418	5TCC-Q18S 10%*	
C110	.1	400		210V051A04	P488N-1	DF-104	C67PJ	ACE401	4EE-P101	
C111	470			215V104A71	BPD-00047	DD-471	BYA10T47	B-347	5GA-T47	
C112	4700			215V104A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C113	22		10%		1469-000022	TCZ-22	22R5J22	CNO-422	M5-422	①
C114	.1	400		210V051A04	P488N-01	DF-104	CUB4P1	GEM-401	4TM-P1	
C115	10000	1400		215V20A03			HVE16S	2EV-110	20HKB-SI	
C116	10000	1400		215V20A03			HVE16S	2EV-110	20HKB-SI	
C117	10000	1400		215V20A03			HVE16S	2EV-110	20HKB-SI	
C118	.022	400		210V052A23	P488N-022	DD-203	CUB4S22	GEM-4122	4TM-S22	
C119	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5EK-S1	
C120	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C121	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C122	4700			215V104A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C123	2.8		NPO	215V123A29	NPO-SI 2.2	TCZ-2R2	C10V22C	CNO-522	5TCCB-V22	
C124	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C125	4700			215V104A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C126	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C127	47		10%	RCM20B470K	1469-0047	DD-470	22R5A47	CNO-447	M5-447	
C128	4.7		NPO ± .25mmf	215V126A79					5TCCB-V47S ± .25mmf*	
C129	33		5%	213V03A30	1469-000033	TCZ-33	22R5Q33	CNO-433	M5-433	
C130	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C131	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C132	22		10%	213V06A21	1469-00022	TCZ-220	22R5T22		M5-322	
C133	.15	600		210V21A54	P688N-15			GEM-6015	6TM-P15	
C134	.15	600		210V21A54	P688N-15			GEM-6015	6TM-P15	
C135	680			215V118A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C136	680			215V118A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C137	680			215V118A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C138	680			215V118A81	BPD-00068	DD-681	BYA10T68	B-368	5GA-T68	
C139	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C140	10000			215V11A03	BPD-01	DD-103	BYA10S1	B-110	5EK-S1	
C141	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C142	4700			215V114A72	BPD-0047	DD-472	BYA10D47	B-347	5HK-D47	
C143	.15	600		210V21A54	P688N-15			GEM-6015	6TM-P15	
C144	10000	1400		215V20A03			HVE16S	2EV-110	20HKB-SI	
C145	10000	1400		215V20A03			HVE16S	2EV-110	20HKB-SI	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.
① Some versions may use 22mmf NPO in this application (Part #215V122A20).

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA Westinghouse PART No	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1500Ω	½	270V002H03	F1-7		↑ Q1-1037	↓ UR1598	Picture
B	500K			R2-41				Volume, Tap ⑨ 50K
C	Switch			(KB-1 or KR-1)*				

CONTROLS (cont)

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA Westinghouse PART No	CENTRALAB PART No	CLAROSTAT PART No	IRC PART No	MALLORY PART No.	INSTALLATION NOTES
R2A	60K	½	V-15R5-3	B-31		A47-75K-S	Q1J-125	U41	Horiz. Hold, Note 1
B	Shaft			Not Reg.		FS-3	Not Reg.	Not Reg.	
R3A	1.5meg	½	V-15R8-4	AB-743		A47-1.5meg-S	Q1J38	U155	Vert. Hold, Note 2
B	Shaft			AK-3		FS-3	Not Reg.	Not Reg.	
R4A	3000Ω	2(WW)	270V023H01	WW-302		A43-3000	WPK-3000	WP33	Brightness
B	Shaft			Not Reg.		FS-3	Not Reg.	Not Reg.	
R5A	3500Ω	½	270V13H01	B-7		A47-2500-S	Q1J-112	U8	Color
B	Shaft			Not Reg.		FS-3	Not Reg.	Not Reg.	
R6A	500K	½	270V129H01						Vert. Lin.
B	5meg	½							Sync
C	5meg	½							Height
R7A	600Ω	½	270V015H03	AB-4		A47-750-S	Q1J-105	PTA75L	Quieting
B	Shaft			AK-19		RN-3	TQ	Not Reg.	
R8	250K	2(WW)	270V012H01						Focus
R9A	30Ω	2(WW)	270V018H03	WW-300		A43-30	WPK-30	R30L	Blue Horiz. Tilt
B	Shaft			Not Reg.		FKS-1/4	Not Reg.	Not Reg.	
R10A	20Ω	2(WW)	270V016H03	WW-200		A43-20	WPK-20	R20L	Red-Green Horiz. Tilt
B	Shaft			Not Reg.		FKS-1/4	Not Reg.	Not Reg.	
R11A	20Ω	2(WW)	270V018H03	WW-200		A43-20	WPK-20	R20L	Red-Green Horiz. Tilt Bal.
B	Shaft			Not Reg.		FKS-1/4	Not Reg.	Not Reg.	
R12	250Ω	½	270V015H05				Q1J-301		Blue Vert. Amp.
R13A	150Ω	½	270V015H04	AB-3					Green Vert. Amp.
B	Shaft			AK-1					
R14A	150Ω	½	270V015H04	AB-2					Red Vert. Amp.
B	Shaft			AK-1					
R15A	4Ω	2(WW)	270V018H01	WW-040		A43-5	WPK-10	R5L	Field Neut. Coil Amp.
B	Shaft			Not Reg.		FKS-1/4	Not Reg.	Not Reg.	
R16	100Ω	½	270V015H03					UI	Blue Vert. Tilt
R17	100Ω	½	270V015H03					UI	Green Vert. Tilt
R18	100Ω	½	270V015H03					UI	Red Vert. Tilt
R19A	2meg	½	270V016H02	B-75		A47-2meg-S	B1J-139	PTA25L	Red Screen
B	Shaft			Not Reg.		FKS-1/4	TM-1 Kit	Not Reg.	
R20A	500K	½	270V015H01	B-59		A47-500K-S	B1J-133	PTA55L	Blue Background
B	Shaft			Not Reg.		FKS-1/4	TM-2 Kit	Not Reg.	
R21A	2meg	½	270V016H01	B-75		A47-2meg-S	B1J-139	PTA25L	Blue Screen, Note 3
B	Shaft			Not Reg.		FKS-1/4	TM-2 Kit	Not Reg.	
R22A	500K	½	270V015H01	B-59		A47-500K-S	B1J-133	PTA55L	Green Background
B	Shaft			Not Reg.		FKS-1/4	TM-2 Kit	Not Reg.	
R23A	2meg	½	270V016H01	B-75		A47-2meg-S	B1J-139	PTA25L	Green Screen
B	Shaft			Not Reg.		FKS-1/4	TM-2 Kit	Not Reg.	

* Use KR with CRL "red label" controls and KB with "blue label" controls.
† "Concentrikit" Equivalent: K-6 Kit with Base Elements & Shafts: R17-109, P13-116 (Panel)
(Not available as a factory assembled unit.) R13-133X, R2-131 (Rear)
76-J (Switch)

Note 1. Alternate Part #270V042H02 may be used in some versions.
Note 2. Alternate Part #270V042H04 may be used in some versions.
Note 3. Alternate Part #270V015H02 may be used in some versions.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	Westinghouse PART No	NOTES
R24	3300Ω	4	251V014H01	
R25	18meg		250V21AA6	
R26	2.2meg		250V223A35	
R27	1000Ω		250V221A02	
R28	470K		250V224A74	
R29	470Ω		250V221A71	
R30	470Ω		250V224A71	
R31	68Ω		250V228A60	
R32	4700Ω		250V093H03	
R33	4700Ω		250V224A72	
R34	100K		250V221A04	
R35	470Ω		250V224A71	
R36	68Ω		250V228A60	
R37	8200Ω		250V093H08	
R38	470Ω		250V224A71	
R39	56Ω		250V225A60	
R40	15K		250V035H15	
R41	6800Ω	1	250V358A82	
R42	68K		250V225A63	
R43	180Ω		250V221A81	
R44	8200Ω		250V228A32	
R45	3300Ω		250V223A32	
R46	3900Ω		250V223A92	
R47	3¶Ω		250V222A70	
R48	3300Ω		250V223A32	
R49	4700Ω		250V224A72	
R50	1800Ω 5%		250V21AA83	
R51	6800Ω		250V228A82	
R52	4700Ω	4	251 V014H06	
R53	560Ω		250V225A61	
R54	180Ω	1	250V21AA81	
R55	4700Ω	7	251V014H04	
R56	100K	2	250V42AA04	
R57	3900Ω	4	251V014H10	
R58	1500Ω	2	250V42AA52	
R59	4700Ω		250V224A72	
R60	18K		250V21AA53	
R61	27K	1	250V322A73	
R62	1800Ω		250V221A82	
R63	100Ω		250V221A01	
R64	4700Ω	7	251V014H04	
R65	3300Ω	4	251V014H01	
R66	470Ω		250V224A71	
R67	120K		250V222A24	
R68	3¶K	3	251V014E12	
R69	12K		250V21AA23	
R70	1000Ω		250V221A02	
R71	330Ω	1	250V323A31	
R72	12K		250V21AA23	
R73	22K	1	250V322A23	
R74	68K		250V226A83	
R75	270K		250V224A74	
R76	150K		250V221A54	
R77	33K		250V223A33	
R78	470K		250V224A74	

ITEM No.	RATING OHMS	RATING WATT	Westinghouse PART No	NOTES
R79	1.8meg		250V32IA85	
R80	22K	6	251V014E09	
R81	8200Ω		250V228A32	
R82	6800Ω	1	250V326A82	
R83	100K	1	250V32IA04	
R84	1200Ω		250V221A22	
R85	1meg		250V221A05	
R86	270K		250V222A74	
R87	680K		250V226A84	
R88	470K		250V224A74	
R89	180K		250V32IA84	
R90	47K	2 (Panel)	250V323A73	
R91	33K		250V223A33	
R92	270Ω	2	250V422A71	
R93	1000Ω			
R94	1000Ω			
R95	1meg		250V32IA05	
R96	1.2meg		250V32IA25	
R97	6800Ω		250V226A82	
R98	220K		250V222A34	
R99	470K		250V224A74	
R100	47K		250V224A73	
R101	56K	1	250V325A53	
R102	33K		250V223A33	
R103	1000Ω		250V221A02	
R104	220K		250V222A24	
R105	56K		250V225A53	
R106	3900Ω		250V223A92	
R107	1meg		250V32IA05	
R108	100Ω		250V221A01	
R109	150Ω		250V221A51	
R110	150Ω		250V221A51	
R111	150Ω		250V221A51	
R112	3900Ω	7	251V014E08	
R113	10K		250V22IA03	
R114	4700Ω	1	250V324A72	
R115	470K	2	259V003H07	
R116	470K	2	259V003H07	
R117	4.7meg	2	259V003H01	
R118	4.7meg	2	259V003H01	
R119	4.7meg	2	259V003H01	
R120	4.7meg	2	259V003H01	
R121	4.7meg	2	259V003H01	
R122	4.7Ω		251V004A78	
R123	4.7Ω		251V004A79	
R124	1.8meg		259V001H02	Note 1
R125	1.8meg		259V001H02	Note 1
R126	220K		250V222A24	
R127	330Ω	1	250V323A31	
R128	150K		250V22IA54	
R129	5600Ω	2	250V325A62	
R130	100Ω		250V221A01	
R131	6800Ω		250V226A82	
R132	100K		250V32IA04	
R133	68K		250V226A83	

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	Westinghouse PART No	NOTES
R134	100Ω		250V221A01	
R135	270Ω		250V221A71	
R136	10K		250V221A03	
R137	1meg		250V32IA05	
R138	680K		250V226A84	
R139	680K		250V226A84	
R140	18meg		250V21AA86	
R141	1meg		250V221A05	
R142	1500Ω		250V22IA52	
R143	1800Ω		250V22IA82	
R144	1meg		250V32IA05	
R145	1meg		250V32IA05	
R146	100K		250V32IA04	
R147	12K		250V32IA23	
R148	68K		250V226A23	
R149	18K	1	250V32IA73	
R150	470Ω	1	250V324A71	
R151	27K	1	250V322A73	
R152	220Ω		250V222A21	
R153	4700Ω		250V324A72	
R154	270Ω		250V22IA71	
R155	39K	1	250V323A33	
R156	15K	1	250V32IA53	
R157	33K	2	250V423A33	
R158	5600Ω		250V225A62	
R159	82K		250V22IA83	
R160	150K		250V325A54	
R161	100K		250V22IA04	
R162	100K 5%		250V32IA04	
R163	47K 5%		250V324A73	
R164	15K	2	250V42IA55	
R165	100K		250V22IA04	
R166	82K		250V22IA83	
R167	180K		250V22IA54	
R168	3300Ω	2	250V423A32	
R169	27K	2	250V422A73	
R170	12K	1	250V32IA23	
R171	4700Ω		250V224A72	
R172	47K	4	251V014H14	

ITEM No.	RATING OHMS	RATING WATT	Westinghouse PART No	NOTES
R173	2200Ω		250V223A22	
R174	100K		250V22IA04	
R175	150K		250V22IA54	
R176	470K		250V224A74	
R177	100K		250V32IA04	
R178	100K		250V22IA04	
R179	470K		250V224A74	
R180	1000Ω		250V22IA02	
R181	470K		250V224A74	
R183	1000Ω		250V22IA02	
R183	470K		250V224A74	
R184	1000Ω		250V22IA02	
R185	4700Ω 5%		250V21AA72	
R186	22K 5%		250V42AA23	
R187	4700Ω 5%		250V21AA72	
R188	2700Ω		250V222A72	
R189	47K	1	250V324A73	
R190	100Ω		250V22IA01	
R191	47K	1	250V324A73	
R192	47K	1	250V324A73	
R193	100Ω		250V22IA01	
R194	56K	2	259V003H54	
R195	8200Ω		250V228A32	
R196A	700Ω	10	251V014H09	
B	1100Ω	30		
R197 ❾	9¶Ω	30	251V017H03	
R198	48Ω	35	251V017H06	Note 2
R199	680K		250V226A84	
R200	820Ω		250V228A21	
R201	6800Ω	4	251V014H08	
R202	22K		250V322A23	
R203	270Ω		250V222A71	
R204	33K	4	251V014H09	
R205	27K		250V322A73	
R206	47K	3	250V014H04	
R207	8200Ω		250V228A32	
R208	680K		250V226A84	
R209	4700Ω		250V324A72	

Note 1. Matched pair.
Note 2. Ch. V-2367-2 use 45Ω 25W in this application (Part #251V017H07).

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA Westinghouse PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1A	1st Video IF	V-16187-1					
B	41.25MC Trap						
L2	2nd Video IF	V-15068-2	17-4537	TV-130	6219	VP-3	
L3	47.25MC Trap	230V023H02	30-1049	TV-153			
L4	3rd Video IF	V-15068-3	17-4537	TV-130	6219	VP-3	
L5	4th Video IF	V-15068-2	17-4537	TV-130	6219	VP-3	
L6	5th Video IF Assy.	235V002H01					
L7A	6th Video IF	V-16186-1					
B	41.25MC Trap						
L8	RF Choke	230V019H05					14 Microhenries
L9	Series Peaking Coil	230V019H06	19-3075	TV-186	6172	VP-2	73 Microhenries
L10	Shunt Peaking Coil	230V019H09	19-3500	TV-185	6174	VP-2	500 Microhenries
L11	RF Choke	230V019H05					14 Microhenries
L12	1st Video Amp. Plate Trans.	235V018H01					
L13	Series Peaking Coil	230V019H06	19-3075	TV-186	6172	VP-2	73 Microhenries
L14	3.58MC Trap	230V009H02					
L15	Series Peaking Coil	230V010H04	19-3330	TV-190	6132	VP-7	350 Microhenries
L16	Shunt Peaking Coil	230V010H04	19-3330	TV-190	6132	VP-7	350 Microhenries
L17	RF Choke	230V019H04		SW-531			4.7 Microhenries
L18	Series Peaking Coil	V-15480-3	19-3126		6130		140 Microhenries
L19	4.1MC Trap	230V012H06					
L20	RF Choke	230V019H05					14 Microhenries
L21	RF Choke	230V019H05					14 Microhenries
L22	1st Sound IF	230V012H04	17-3413 *	TV-151	1489 *		
L23	Quadrature Coil	230V031H03			1481	SD-5	
L24A	Chroma Trans.	235V012H01					
B	4.5MC Trap						
L25	RF Choke	230V019H01	19-3036	TV-180	6176	VP-1	32 Microhenries
L26	Demodulator Driver Trans.	235V013H01					Tapped ④ .8Ω
L27	Burst Amp.Trans.	235V018H01					
L28	RF Choke	230V019H05					14 Microhenries
L29	Series Peaking Coil	230V066H01					1.4 Millihenries
L30	Series Peaking Coil	V-15480-3	19-3126		6130		140 Microhenries
L31	Chroma Ref. Osc. Plate	230V012H07	17-5011				
L32	Cathode Choke	230V019H05					14 Microhenries
L33	Chroma Ref. Osc. Plate Trans.	235V009H03					500 Microhenries
L34	Shunt Peaking Coil	230V019H09					14 Microhenries
L35	RF Choke	230V019H05					
L36	G-Y Phase Coil	230V029H01					
L37	Series Peaking Coil	230V066H02					1.4 Millihenries
L38	RF Choke	230V028H02					3.3 Microhenries ④
L39	RF Choke	230V028H02					3.3 Microhenries ④
L40	RF Choke	230V028H02					3.3 Microhenries ④
L41	RF Choke	230V028H02					3.3 Microhenries ④
L42	RF Choke	230V028H02					3.3 Microhenries ④
L43	RF Choke	230V028H02					3.3 Microhenries ④
L44	Fil. Choke	230V019H06	19-1000	BC-561	4602		1.1 Microhenries
L45	Fil. Choke	230V019H06	19-1000	BC-561	4602		1.1 Microhenries

* Disregard tap. ④ IRC Part #CLA.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA Westinghouse PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	Thordarson PART No.	NOTES
L46	9¶Ω		230V005A01						Horiz. Freq

PARTS LIST & DESCRIPTION (continued)

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE (0 CURRENT 1000 ∿)	Westinghouse PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L47	.650A	18Ω	.7 Hy.	430V006H01						

COILS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA								
		Westinghouse PART No.	Halldorson PART No.	Merit PART No.	Miller PART No.	Ram PART No.	Rogers PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L48	Vert. Dyn. Conv. Sawtooth Choke (.5 Hy.)	430V023H01							20C58 ①	
L49	Horiz. Linearity (.4 - 1.9 MH)	498V001H01								
L50	Width Choke (.6 MH)	498V003H01								
L51	Vert. Conv. Isol. Choke Assy.	498V010H01								
A	Green (400 MH)									
B	Blue (400 MH)									
C	Red (400 MH)									
L52	Red & Green Horiz. Amp. (1.1 - 8.2 MH)	498V005H03								
L53	Blue Horiz. Amp. (1.7 - 11.5 MH)	498V005H04								
L54	Red & Green Horiz. Amp. Balance (.15 - 1.5 MH) ①	498V004H01								
L55	Conv. Yoke Assy.	498V007H01								
A	Green									
B	Blue									
C	Red									
L56	Field Neutralizing	498V015H01								

① Drill new mouning hole(s).

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	Westinghouse PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	125V @ 2.6A tap @ 117V @ 2.7A	6.3V @ 1.9A		410V005H01						

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA							
		Westinghouse PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Rogers PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Vert. Output	430V009H01							
T3	Yoke (Horiz. 11.5MH) (Vert. 104MH)	490V003H01							
T4	Horiz. Output	493V002H01							
T5	Pulse	498V002H01							

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	Westinghouse PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T6	5000Ω	3-4Ω	430V027H01	Z1001	A-2930	AU-601	A-3877	24S51	S-3X	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	Westinghouse PART No.	QUAM PART No.	
SP1	6"	PM	3-4Ω	570V005H01	6A1	

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	Westinghouse PART No.	REPLACEMENT DATA	
K1	Vert. Integrator	10000mmf, 2000mmf, 5000mmf, 5000mmf, 22K, 8200Ω, 8200Ω, 22K	V-11192-1	Aerovox Centralab Sprague	PA-111 PC-101 V-2

PARTS LIST AND DESCRIPTIONS (Continued)

RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	Westinghouse PART No.	FEDERAL PART No.	GENERAL ELECTRIC PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.650A	295V003H01 ①				757S ① F4 ②	① Selenium Type. ② Silicon Type
M2	.650A	295V003H01 ①				757S ① F4 ②	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Westinghouse PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3	C	7A 125V	758V001H06	V-16214-18	332007 (C-7A-125V)	346013	C7	HC 5 to 7
M4	C	3/4A 125V	758V001H04	V-16214-12	332. 750 (C- 3/4A- 250V)	346003	C 3/4	HC 1/2 to 3/4

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		Westinghouse PART No.	CBS PART No.	SYLVANIA PART No.	
M5	1N60		1N60	1N295	Luminance Detector
M6	1N60		1N60	1N295	Chroma & Sound Detector

MISCELLANEOUS

ITEM No.	PART NAME	Westinghouse PART No.	NOTES
M7	Tuner	470V006H01	VHF Ch. V-2367-1
	Tuner	473V008H01	VHF, with UHF provisions, Ch. V-2367-2
	Tuner	474V008H01	UHF Ch. V-2367-2
M8	Delay Line	230V017H02	
M9	Switch	756V003H01	Width, 3 Position (Rotary Wafer Type)
M10	Switch	756V021H01	Field Neutralizing, DPDT (Side Type)
M11	Crystal	296V001H01	Chroma Ref. Osc. 3.579545MC
M12	Magnet	V-15300-1	Purity
M13	Magnet	498V016H01	Blue Beam Positioning
M14	Tuning Cap.	330V004H01	Hue Control, 5-25mmf
	Printed Board	350V014H01	

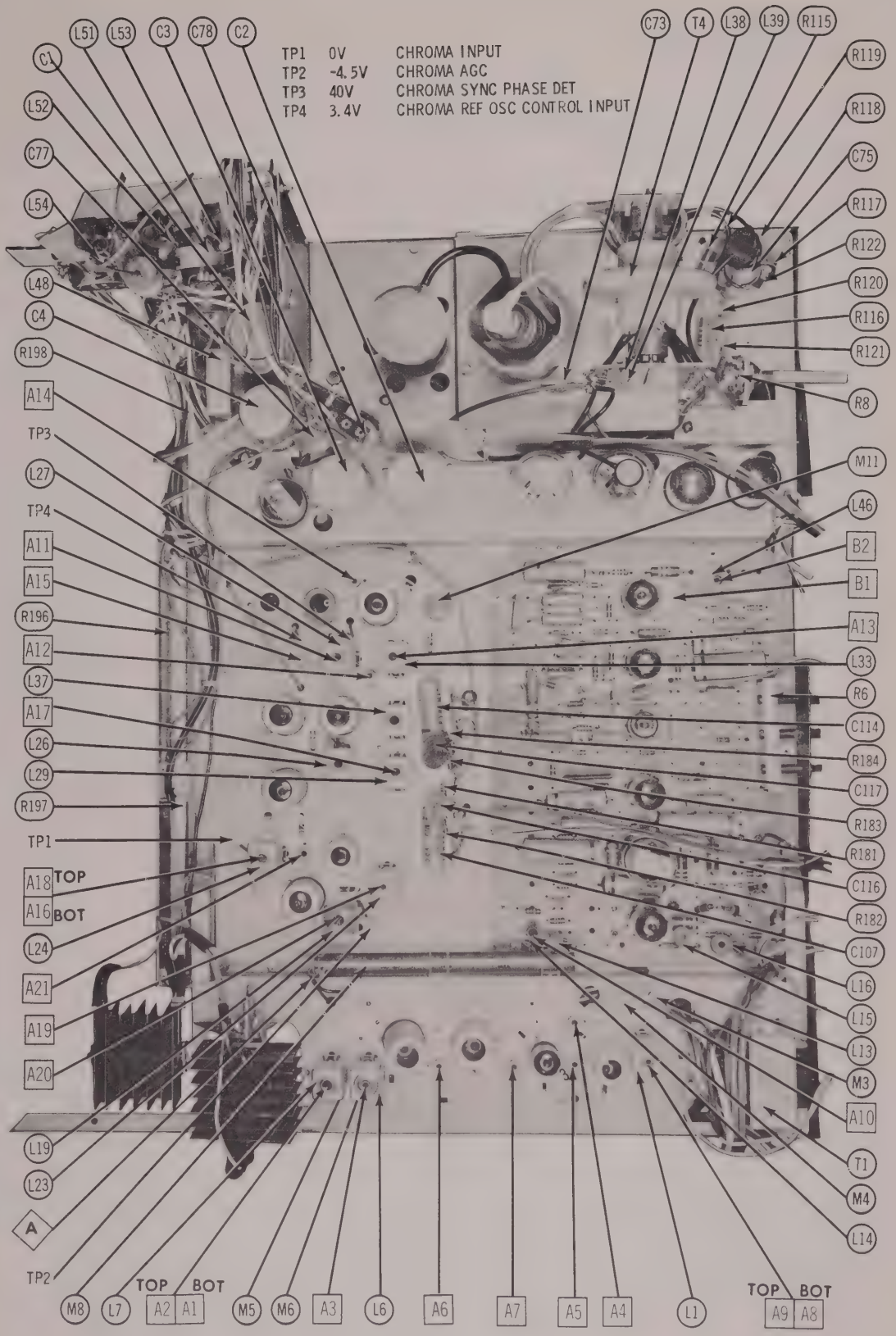
CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Safety Glass	630V007H01	
Mask	610V013H01	
Knob	550V003H01	Channel Selector, VHF Models
Knob	550V022H03	Channel Selector, UHF-VHF Models
Knob	V-15667-1	Fine Tuning
Knob	V-15668-1	UHF Dial
Knob	V-15810-3	Volume-On-Off
Knob	V-15812-4	Picture
Knob	550V066H03	Brightness, Horiz., Vert. Hold
Knob	550V002H02	Hue & Color, Models H-21CT258, H-21CTU258
Knob	550V002H01	Hue & Color, Models H-21CT259, H-21CTU259
Cabinet	516V056H01	Mahogany, Models H-21CT258, H-21CTU258
Cabinet	516V056H02	Limed Oak, Models H-21CT259, H-21CTU259
Cover	558V030H03	Side Control Panel, Models H-21CT258, H-21CTU258
Cover	558V030H04	Side Control Panel, Models H-21CT259, H-21CTU259

WIRING DATA

High Voltage Lead	Use BELDEN No.	8389
Shielded Hook-up Wire	Use BELDEN No.	8885 (Single Conductor) 8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No.	8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No.	8874
300Ω Tuner Input Lead	Use BELDEN No.	8225
300Ω Antenna Lead-in	Use BELDEN No.	8230 or 8275
Antenna Rotor Cable	Use BELDEN No.	8464 (Flat) or 8484 (Round) - 4 Conductor 8485 (Round) - 5 Conductor 8488 (Round) - 8 Conductor



CHASSIS TOP VIEW

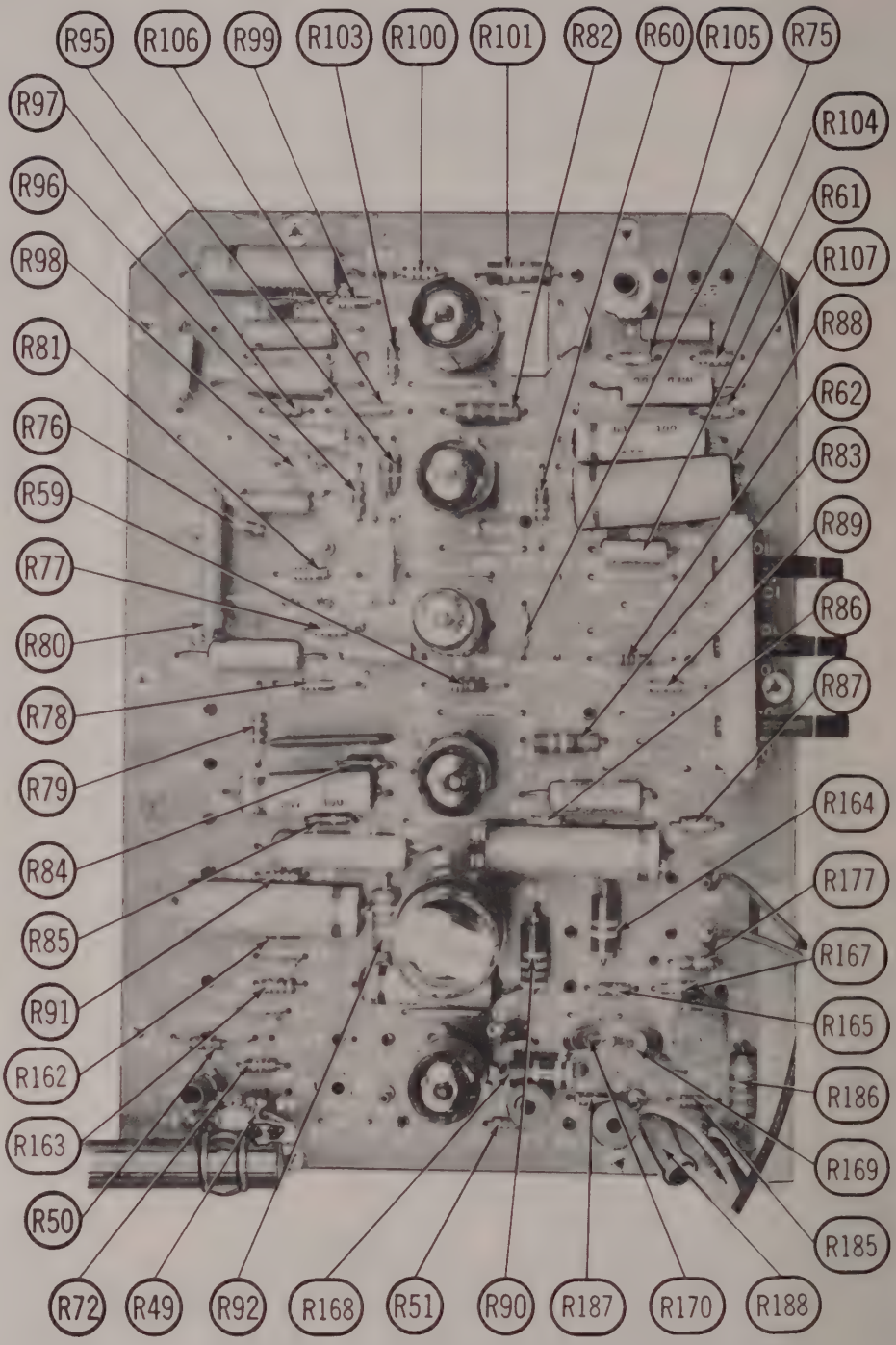
WESTINGHOUSE MODELS H-21CT258, H-21CT259,
H-21CTU258, H-21CTU259 (Ch. V-2367-1, -2)

RESISTANCE MEASUREMENTS

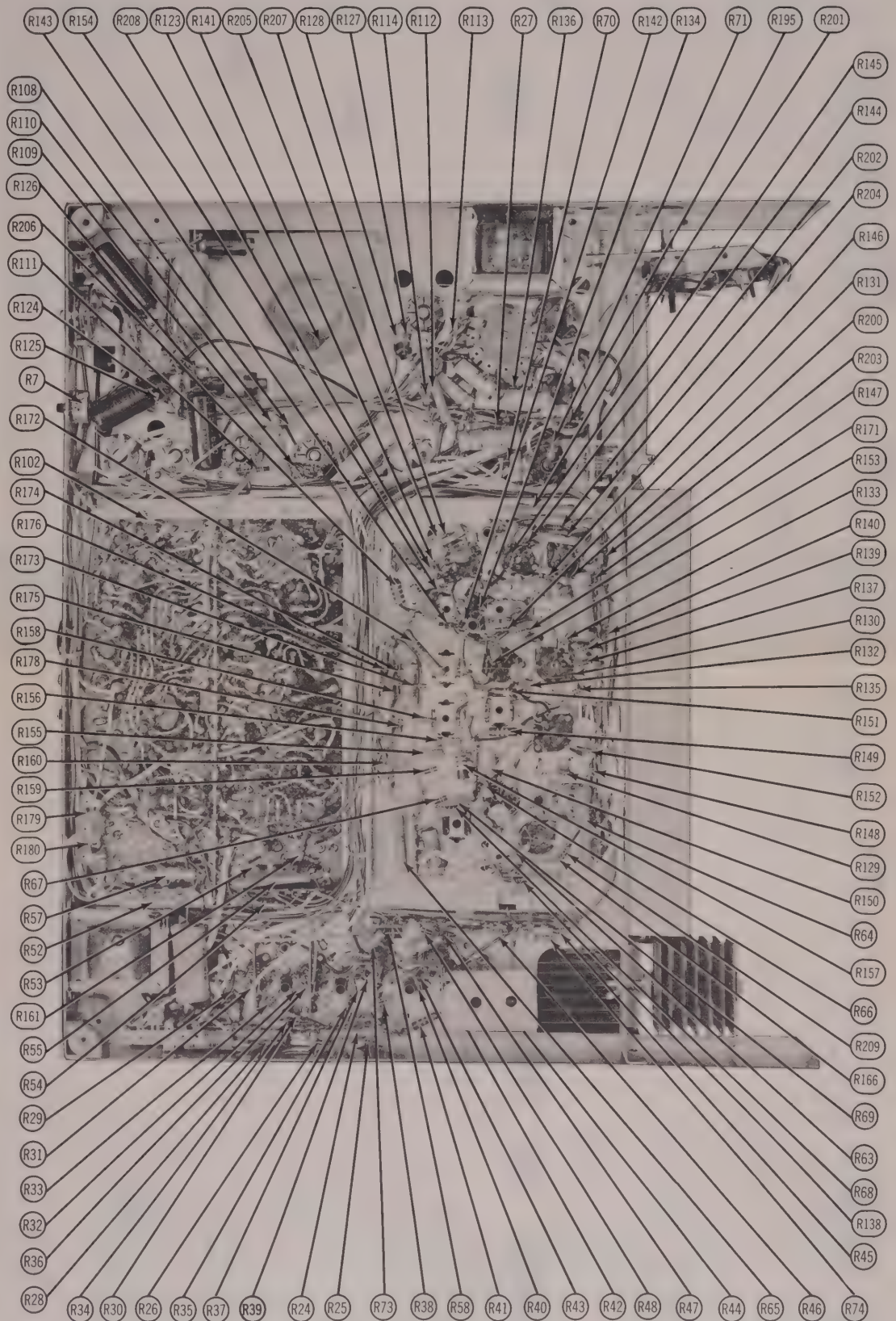
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	3BZ6	100K	68Ω	11.5Ω	12Ω	†2300Ω	†2300Ω	0Ω		
V2	3BZ6	100K	68Ω	12Ω	12.5Ω	†2300Ω	†2300Ω	0Ω		
V3	5AN8	†24K	13K	1800Ω	12.5Ω	14Ω	†2300Ω	†2300Ω	.1Ω	56Ω
V4	5AN8	†1800Ω	5000Ω	1500Ω	14Ω	15Ω	†6800Ω	†62K	.1Ω	180Ω
V5	6BH8	3300Ω	60K	†12K	7.5Ω	8.5Ω	700Ω	1300Ω	†1800Ω	†7800Ω
V6	5BT8	2.2meg	0Ω	1.2meg	5Ω	1Ω	520K	†1400Ω	†28K	†11K
V7	6AW8A	0Ω	2.5meg	820K	10Ω	9Ω	0Ω	2.2meg	†8000Ω	†8000Ω
V8	3BN6	• 400Ω	3.2Ω	8.5Ω	9Ω	†27K	7Ω	†220K		
V9	5V6GT	NC	15Ω	†345Ω	†1000Ω	0Ω	NC	16Ω	330Ω	
V10	3CS6	70K	0Ω	5Ω	5.5Ω	†30K	†22K	2.3meg		
V11	7AU7	†100K	64K	1200Ω	6.5Ω	6.5Ω	•†4meg	•1.7meg	1200Ω	5.5Ω
V12	5V6GT	TP	7.5Ω	†270Ω	†0Ω	• 1meg	NC	6.5Ω	270Ω	
V13	7AU7	†63K	• 240K	1000Ω	1Ω	1Ω	†63K	2.9meg	1000Ω	0Ω
V14	25DN6	TP	12Ω	0Ω	NC	500K	NC	8.5Ω	†3900Ω	TOP CAP †8.8Ω
V15	25DN6	NC	12Ω	0Ω	TP	500K	NC	15Ω	†3900Ω	TOP CAP †8.8Ω
V16	19AU4GTA	NC	NC	¶600K	NC	†4Ω	NC	15Ω	17Ω	
V17	19AU4GTA	NC	NC	¶600K	NC	†4Ω	NC	16Ω	18Ω	
V18	3A3	PINS 1 THRU 8 HAVE INFINITE RESISTANCE								TOP CAP †350Ω
V19	1X2B	23.5meg	23.5meg	TP	23.5meg	23.5meg	23.5meg	NC	23.5meg	23.5meg
V20	6BK4	†330Ω	†150K	TP	TP	1meg	TP	†150K	TP	TOP CAP INF
V21	12BY7A	•300Ω	900K	0Ω	8.5Ω	8.5Ω	6Ω	†470Ω	†27K	0Ω
V22	6AW8A	1500Ω	1meg	1meg	6Ω	4.5Ω	10K	100Ω	†40K	†5.5Ω
V23	5AM8	1Ω	27K	†47K	2Ω	3Ω	†39Ω	2meg	1meg	0Ω
V24	3AL5	1meg	2meg	2Ω	1Ω	1meg	0Ω	.3Ω		
V25	3AU6	2meg	0Ω	1Ω	0Ω	†5500Ω	†27K	270Ω		
V26	12BH7A	†28K	4700Ω	0Ω	3Ω	3Ω	†35K	4700Ω	0Ω	4.5Ω
V27	21CYP22	†150K	†400K	•†530K	†10K	†15K	•†120K	•†1.2meg	NC	25meg
		Pin 10 NC	Pin 11 •†1.2meg	Pin 12 •†120K	Pin 13 †11K	Pin 14 †150K				
V201	4BQ7A	†4300Ω	600K	INF	11Ω	10Ω	INF	2.2meg	0Ω	0Ω
V202	5AT8	15K	†6500Ω	0Ω	11.5Ω	11Ω	†3600Ω	†6500Ω	0Ω	130K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
• THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION
† MEASURED FROM 295V SOURCE.
† MEASURED FROM PIN 3 OF V17.

NC NO CONNECTION.
TP TIE POINT



PRINTED BOARD - RESISTOR IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PHOTOFACT* Folder

*TRADE MARK

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

BELL SOUND MODELS
T-200 Series, T-210 Series

BELL SOUND MODELS
T-200 Series, T-210 Series

GENERAL INFORMATION

Bell T-200 and T-210 Series tape transports have piano key-type controls for each mode of operation.

Each series has three 4-pole motors for controlling the tape without belts, pulleys, clutches, or mechanical brakes.

Electro-Dynamic braking on each series provides instant braking without straining or breaking the tape. To prevent damage to the tape, an automatic stop on the T-210 Series turns off the take-up motor after the end of the tape has passed through the unit.

All eight models are mechanically alike. They differ electrically in the head arrangement and preamplifiers.

With proper head and preamplifier arrangement, Bell tape transports monaurally record and play back two tracks of material on standard-width recording tape. Recordings can be made from a radio, television receiver, or phonograph, in addition to those made directly from a microphone.

These units have two tape speeds, 7 1/2 and 3 3/4 ips. With both tracks, recording times are as follows:

Reel Size	3 3/4" Speed	7 1/2" Speed
5" (600 ft.)	1 hour	1/2 hour
7" (1200 ft.)	2 hours	1 hour

These tape transports operate on a 60-cycle, 110-120 volt AC supply only.

Manufactured by:
Bell Sound Systems, Inc.
A Division of Thompson Products, Inc.
555 Marion Road
Columbus 7, Ohio

This material compiled and published by

HOWARD W. SAMS & CO., INC., INDIANAPOLIS 6, INDIANA

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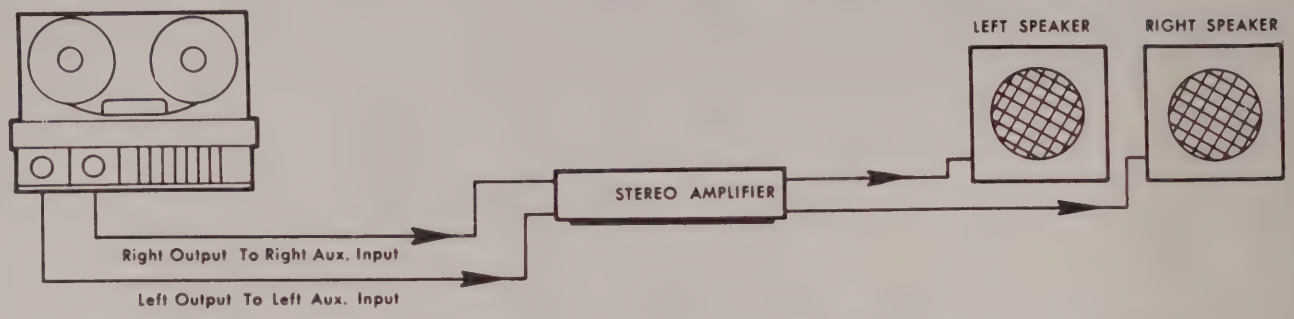
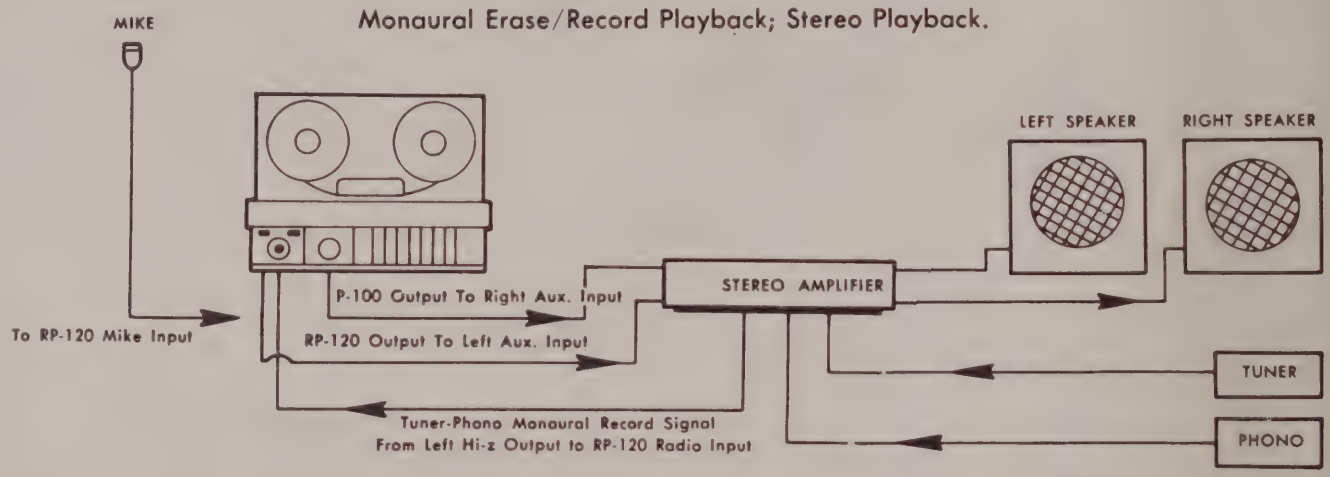
T-211 with 2 P-100 Pre-Amplifiers

Stereo Playback using matched pre-amplifiers
(Recommended procedure for specified performance)



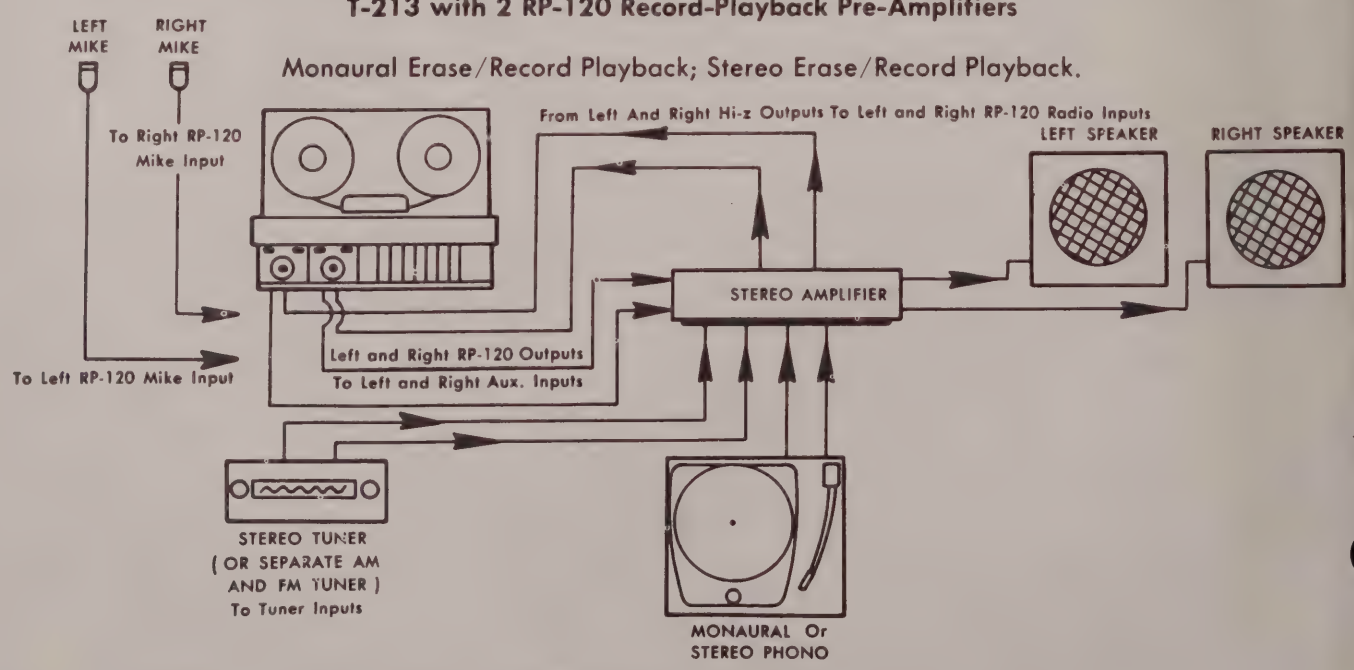
T-212 with 1 RP-120 and 1 P-100

Monaural Erase/Record Playback; Stereo Playback.

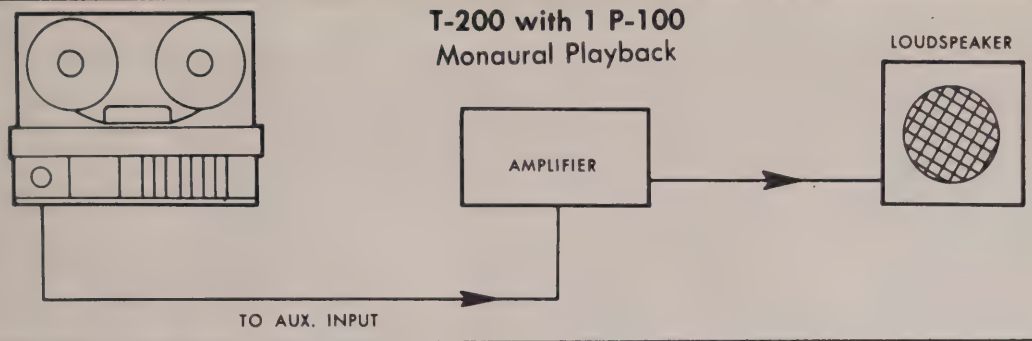


T-213 with 2 RP-120 Record-Playback Pre-Amplifiers

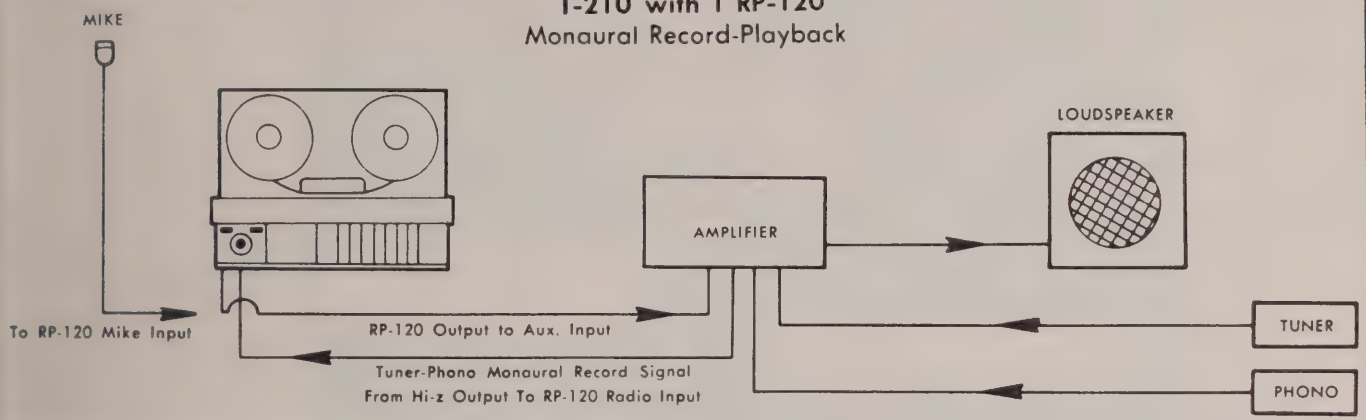
Monaural Erase/Record Playback; Stereo Erase/Record Playback.



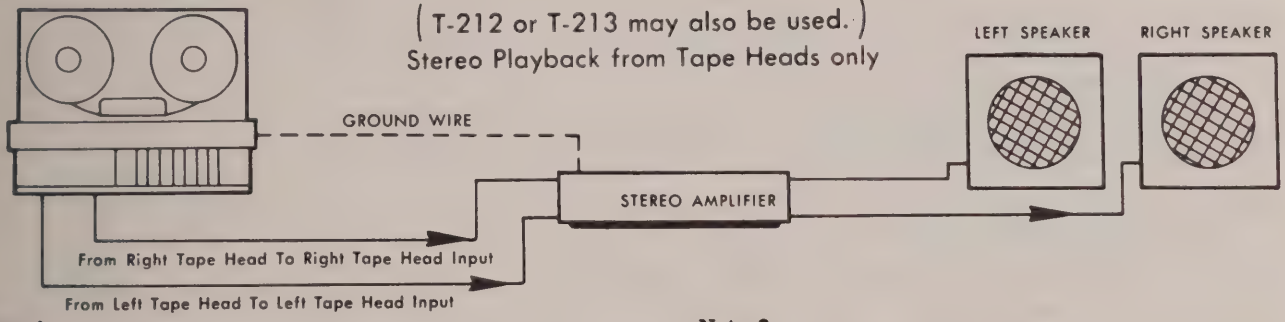
T-200 with 1 P-100
Monaural Playback



T-210 with 1 RP-120
Monaural Record-Playback



T-211
(T-212 or T-213 may also be used.)
Stereo Playback from Tape Heads only


LEFT SPEAKER
RIGHT SPEAKER
GROUND WIRE
STEREO AMPLIFIER
From Right Tape Head To Right Tape Head Input
From Left Tape Head To Left Tape Head Input

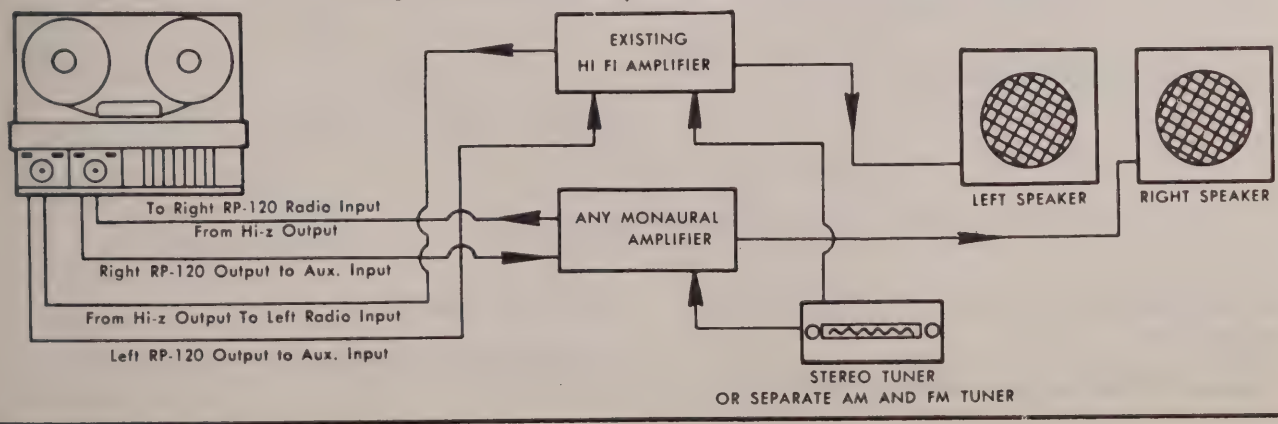
Note 1.

When tape heads are hooked direct to external amplifier, a ground wire is necessary between transport and amplifier chassis.

Note 2.

Any two separate amplifiers with tape head equalization may be used instead of a Stereo Amplifier if desired.

T-213 with 2 RP-120 Record Playback Pre-amplifiers.
Converts an existing Monaural Hi-Fi System to Stereo Record and Playback



FOLDER 3

SPECIFICATIONS

Series	Power Required	Frequency Response
T-200 (Specifications refer to over-all performance with Bell Record-Playback or Playback amplifiers only.)	56 watts maximum	20-10,000 cps ± 2db (Record and Playback)
T-210 (Specifications apply only when tape transport is used with Record-Playback preamplifier.)	56 watts maximum	25-12,000 cps ± 2db (Record-Playback); extends to 15,000 cps (Playback only).

HEAD ARRANGEMENT

Models

T-200--Monaural erase-record..... playback (one RP-120 preamplifier).

T-201--Stereo inline-offset and..... monaural playback only (two P-100 preamplifiers).

T-202--Monaural erase-record..... playback and stereo inline-offset playback (one RP-120 and one P-100 preamplifier).

T-203--Monaural erase-record..... playback and stereo inline or offset erase-record-playback (two RP-120 preamplifiers).

T-206--Consists of T-202, one RP-120, one P-100, and 200CC carrying case.

T-210--Monaural erase-record-..... playback (one RP-120 preamplifier).

T-211--Monaural and stereo playback..... (two P-100 preamplifiers).

T-212--Monaural erase-record-playback..... and stereo playback (one RP-120 and one P-100 preamplifier).

T-213--Stereo and monaural erase-record-..... playback (two RP-120 preamplifiers).

T-216--Consists of T-212, RP-120, and P-100 mounted in 200CC carrying case.

T-218--Consists of T-213 and two RP-120 preamplifiers mounted in 200CC carrying case.

PREPARING FOR OPERATION

1. Plug power cord into any convenient receptacle of proper rating.
2. Depress Stop key to open head assembly so that tape can be inserted.
3. Make certain Record-Playback switch is in Playback.

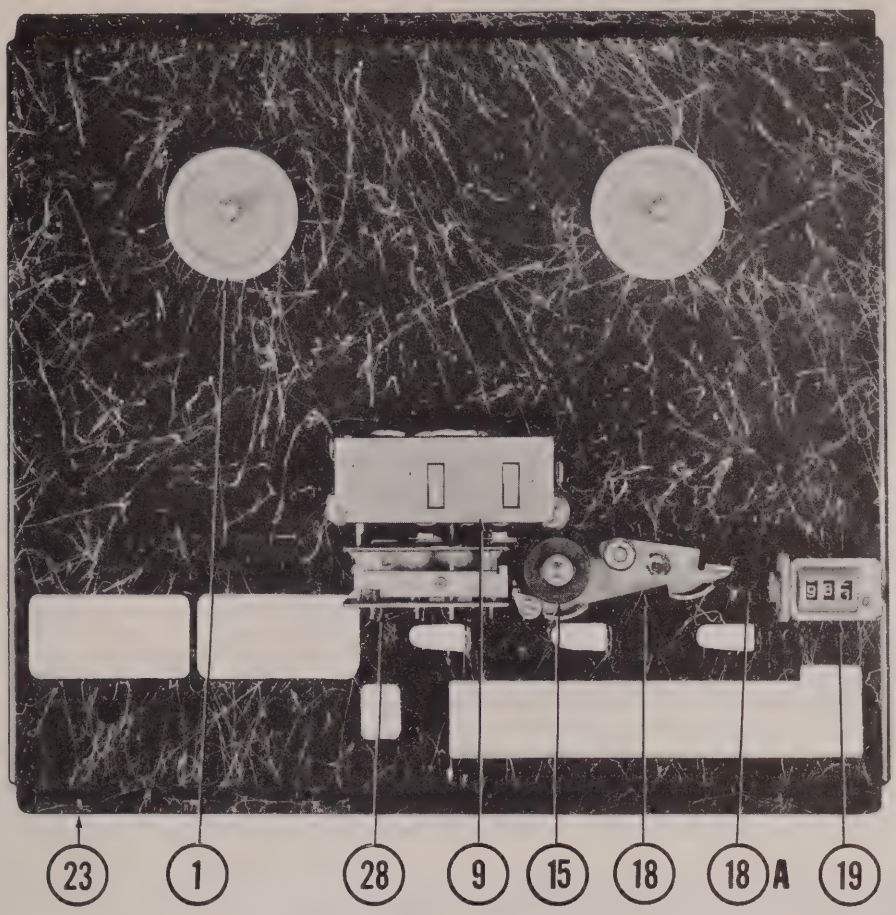


FIG. 1 TOP VIEW OF MECHANISM WITH ESCUTCHEON REMOVED

FUNCTION OF CONTROLS

Stop Key

Depressing this key stops tape in any mode of operation.

Forward Key

Depressing this key rapidly advances tape from supply reel to take-up reel.

Rewind Key

Depressing this key rapidly rewinds tape from take-up reel to supply reel.

Run Key

Depressing this key sets tape in motion for Playback or Record.

3.75 and 7.5 Keys

Depressing either key selects speed of tape transport.

IB-OB Switch (T-200 Series only)

When switch is in IB position, the playback heads are in line for binaural stereo playback. When switch is in OB position, the playback heads are offset for binaural stereo playback. The position of this switch depends upon the style of tape to be played back.

Record-Playback Selector Switch

Turning this switch counterclockwise puts switch in Playback; clockwise, in Record.

On-Off Switch

This switch turns power to unit on or off.

Volume

Turning this control clockwise increases volume; counterclockwise, decreases volume.

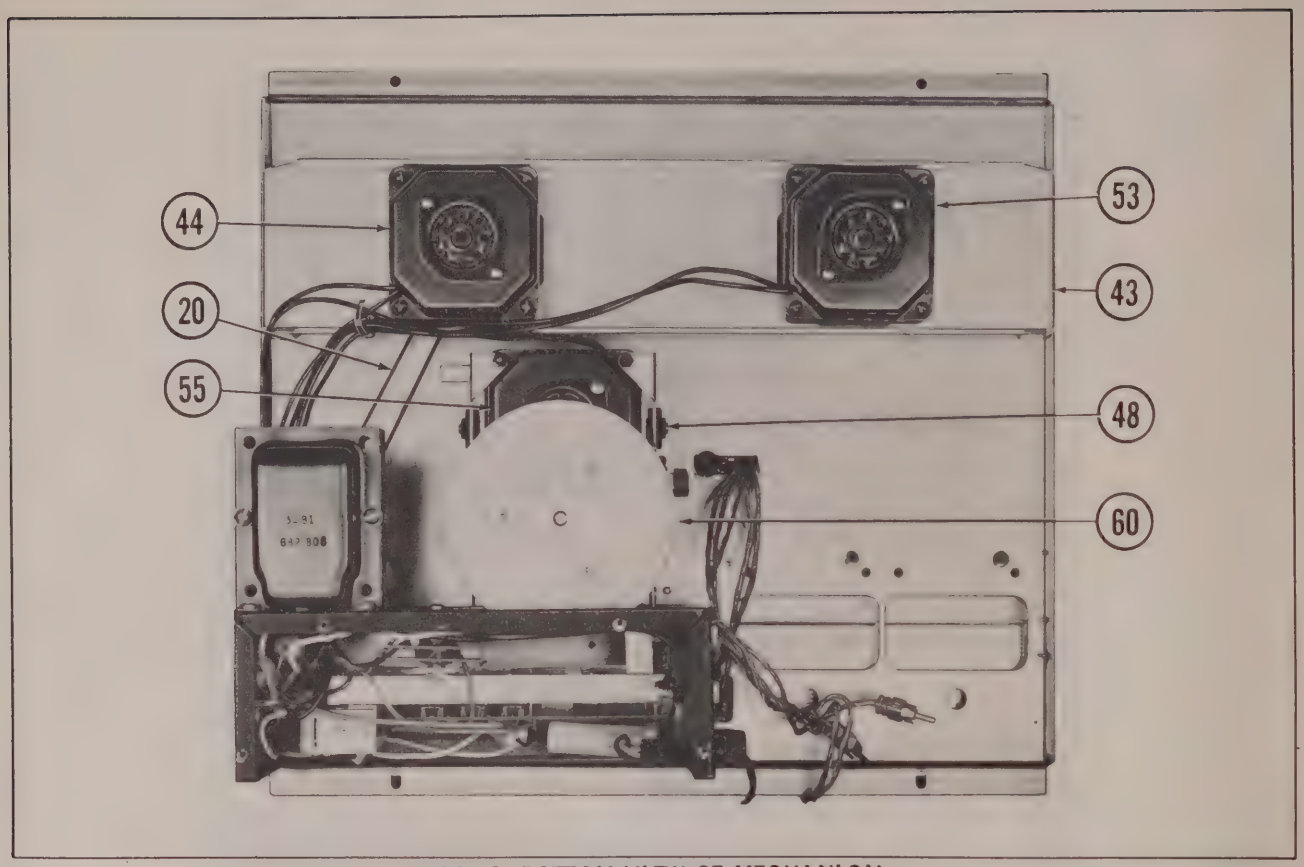


FIG. 2 BOTTOM VIEW OF MECHANISM

OPERATING INSTRUCTIONS

Threading Tape

1. Depress Stop key to open head assembly.
2. Place a full reel of tape on left-hand (supply) reel, making certain reel slots engage protrusions on left-hand platform. Place an empty reel on right-hand (take-up) reel, making certain reel slots engage protrusions on right-hand platform.
3. Unwind about 14" of tape from supply reel. Hold a section of tape taut and insert into tape slot. Make sure dull-coated side of tape faces away from you.
4. Insert free end of tape into one of three slots in hub of take-up reel. Hold tape in place and give reel two or three turns until tape is secured to reel.

To Record from Microphone, Radio Tuner, Record Changer, or Tape Output from Another Amplifier (Monaural)

1. Turn power switch to On position. Allow sufficient time for unit to warm up.
2. Make proper connections on RP-120 preamplifier. (See pages 2 and 3 for typical "hook-ups".)
3. For live recordings, insert microphone plug into mike input jack. To record from record player, radio tuner, or tape output from another amplifier, insert interconnecting leads into radio input jack.
4. Depress proper Speed key for desired speed.
5. Rotate selector switch to right (Record) position. Red pilot light will glow as long as unit is in Record.
6. Place transport in operation by depressing Run key.
7. Adjust Volume level until cathode-ray indicator is about half-closed. This is an average correct reading level.
8. After recording is finished, rotate selector switch to Playback and depress Stop key.

NOTE: Before changing functions, always depress Stop key.

To Record Stereo

1. Place two microphones in front of material to be recorded.
2. Distance between microphones should be at least six feet.
3. Plug left microphone into left RP-120 preamplifier; plug right microphone into right RP-120 preamplifier.

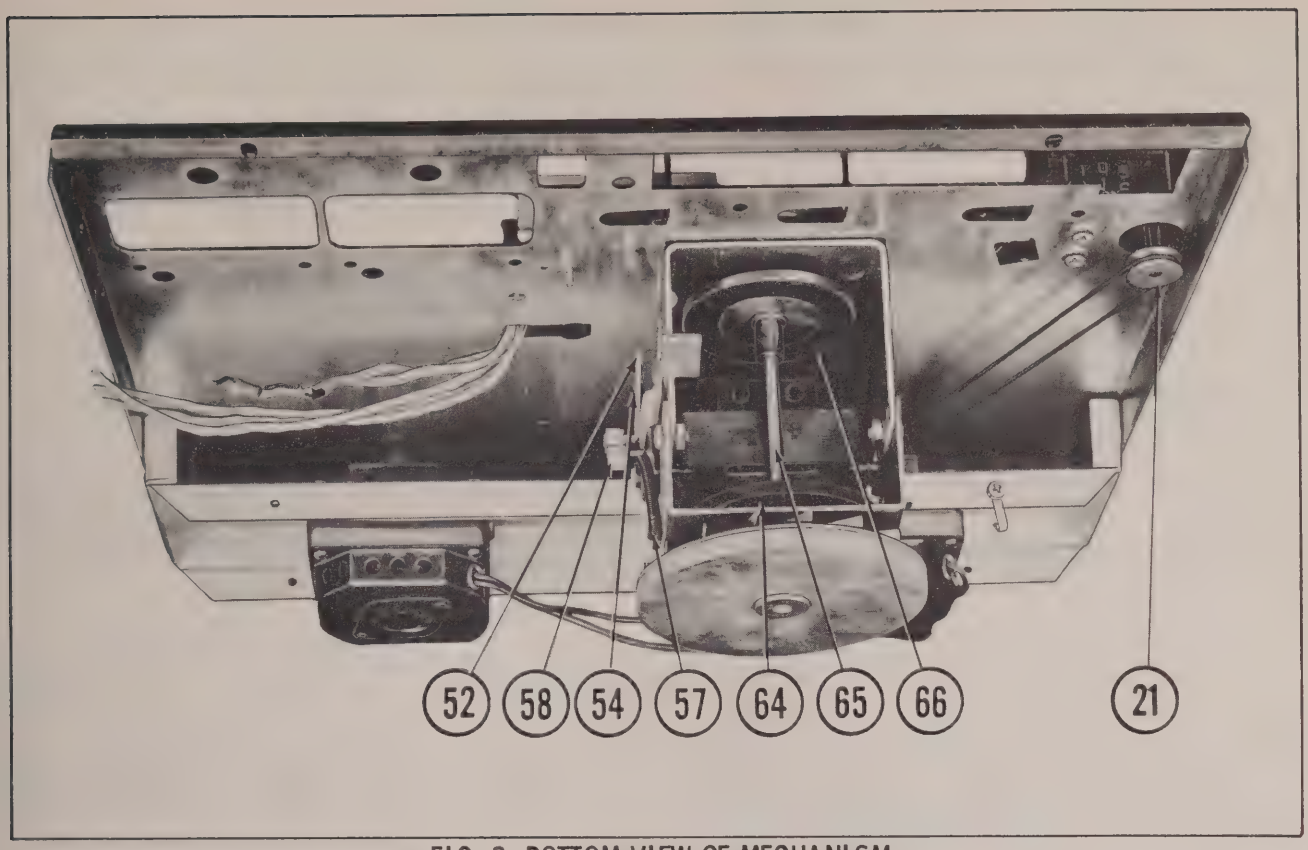


FIG. 3 BOTTOM VIEW OF MECHANISM

4. Make a test recording to determine correct level and balance.

5. Set the two level controls on the RP-120 preamplifiers until the two corresponding cathode-ray level indicators are fluctuating as nearly alike as possible.

To Use Second Track (Monaural)

1. Depress Stop key after all tape is wound onto take-up reel.

2. Remove reel containing tape and place on left-hand (supply) platform.

3. Place empty reel on right-hand (take-up) platform.

4. Thread tape and proceed with recording as previously described.

To Erase Tape

When the selector switch is rotated to the Record position, the erase head is automatically positioned, and any previous recording is erased while a new one is being made. Material no longer needed may be erased, without recording, by placing the selector switch in Record, depressing the Run key, and turning the Volume control to its minimum position. One track is erased at a time monaurally. To erase the second track, reverse the reels and repeat the foregoing procedure.

To Play Recordings

1. Thread tape as described under "Threading Tape."

2. Depress Speed key corresponding to speed at which tape was recorded.

3. Place selector switch in Playback and depress Run key. Be sure selector is in Playback before the Run key is depressed, or tape will be erased.

4. Adjust volume for desired listening level.

MECHANICAL ADJUSTMENTS

Reel Platform

Reel platform (1) must clear the deck plate by 1/32" minimum-1/16" maximum. Both reel platforms must be the same height on the same unit. To adjust, loosen set screw (2) and position reel platforms (1) to correct height. After adjusting, tighten set screw (2).

12-Kc Coil

1. Disconnect lead at point (A) to disable oscillator.
2. Connect output of audio signal generator to microphone input jack and low side to chassis.
3. Set signal generator to 12 kc.
4. Connect Vert. Amp. of scope to record input jack and connect low side to chassis.
5. Adjust A1 for maximum amplitude.
6. Reconnect lead at point (A).

Erase Bias

Erase current should be approximately 14 to 20 milliamps.

1. Connect DC probe of VTVM to Sync jack, common to chassis.
2. Reading should be between 1.4 and 2.2 volts.

Record Bias

1. Connect 100-ohm resistor in series with ground lead of record-playback head.
2. Connect VTVM across 100-ohm resistor.
3. Adjust A2 and A3 for .135 volts.

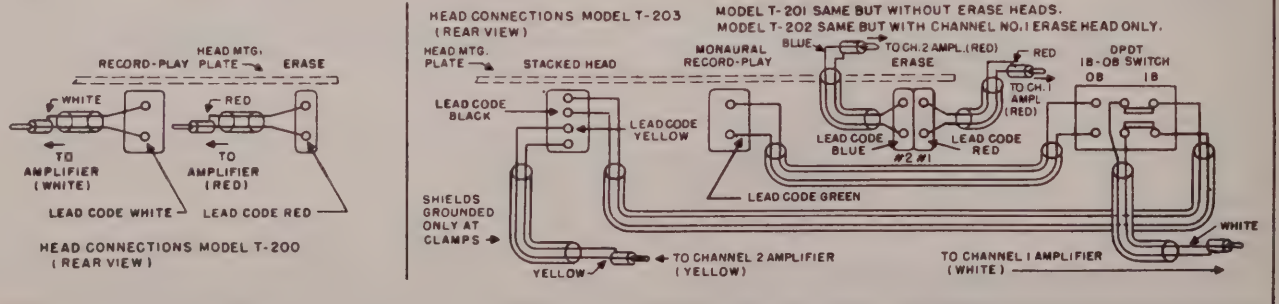
NOTE: To make the foregoing measurements, the erase and record heads should be connected.

PREAMPLIFIER INSTALLATION

If just one preamplifier is to be used, it should be installed in the left position. To install an RP-120 and a P-100 preamplifier or any combination, depending on tape transport head arrangement, proceed as follows:

1. Remove the long aluminum trim strip on front of transport by removing three screws holding it to the deck plate.
2. Remove aluminum cover plate by removing two screws on each end.
3. Remove Phillips head screw in center of gold anodized aluminum cover. Be careful not to lose the spacer between the main and upper deck plates. Remove cover by springing it slightly at one side so that it will pass function key shaft.
4. Remove preamplifier control knobs.
5. Place preamplifier so that control shaft extends through hole in deck plate. Secure with two sheet metal screws at top front and two at rear. Install hex nut on control shaft and tighten all screws.
6. Plug AC power cord into receptacle on left side of tape transport chassis. On-Off switch on tape transport controls power to preamplifiers.
7. Cut anodized panel so that preamplifier plastic control panel or panels will fit into place. If one preamplifier is installed, cut anodized panel at left edge of first notch, cutting off portion of panel to the left. If two preamplifiers are installed, cut at left edge of second notch from left, cutting off portion of panel to left. Panel will now fit in place and allow room for preamplifier control panel or panels. Insert and tighten screw in control of panel.
8. Install plastic preamplifier control panels.
9. Replace long aluminum cover plate and two screws at each end.
10. Replace aluminum trim strip and three screws at front.
11. Press knobs onto control shafts.

Schematic Circuit Diagram for T-200 Series Tape Transports



HEAD AND PREAMPLIFIER CONNECTIONS

T-200 and T-210 with One RP-120

1. Connect White Record-Playback lead to White receptacle.
2. Connect Red erase head lead to Red receptacle.

T-201 and T-211 with Two P-100's

1. Connect left-channel White head lead to Yellow receptacle on left P-100.
2. Connect Yellow head lead of right channel to Yellow receptacle on right P-100.

T-201 and T-211 Tape Head Playback with External Hi-Fi Amplifiers

1. Connect White head lead of left channel to left-channel tape head input.
2. Connect Yellow head of right channel to right-channel tape head input.

NOTE: Make connections with shielded cables and a ground wire between tape transport and external amplifier.

T-202 and T-212 with One RP-120 and One P-100

1. Connect White record-playback head lead of left channel to White receptacle on RP-120.
2. Connect Red monaural erase head lead to Red receptacle on RP-120.
3. Connect Yellow head lead of right channel to Yellow receptacle on P-100.

T-203 and T-213 with Two RP-120's

1. Connect monaural White record-playback head lead of left channel to White receptacle on left RP-120.
2. Connect Red erase head lead of left channel to Red receptacle on left RP-120.
3. Connect Yellow record-playback head lead of right channel to White receptacle on right RP-120.
4. Connect Blue erase head lead of right channel to Red receptacle on right RP-120.
5. On the T-213, connect small Red jumper between Red plastic synchronizing receptacles on each RP-120.
6. Adjust frequency of bias oscillators as described for synchronization.

LUBRICATION

Lubricants applied during manufacture will last for a long time. However, if parts are replaced or after each 1,000 hours of operation, lubricate as follows:

1. Apply one drop of #10 motor oil to top and bottom bearing of take-up motor (44) and rewind motor (53).
2. Apply one drop of #10 motor oil to top and bottom bearings of capstan motor (55).

CAUTION: After oiling this motor, be certain no oil seeps onto motor pulleys.

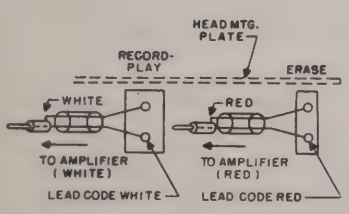
3. Apply one drop of #10 motor oil to top and bottom capstan bearings.

CAUTION: Be sure no oil seeps onto drive pulleys (64) and (66), or onto any part of the capstan shaft that extends above the top deck plate.

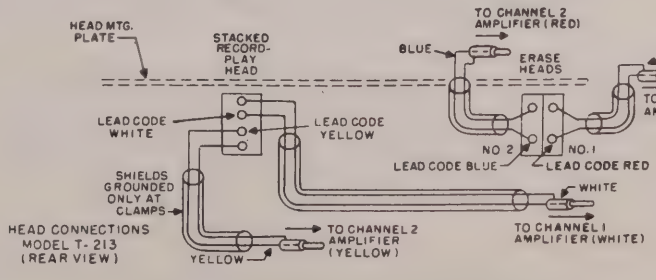
4. Apply one drop of #10 motor oil to pressure roller (15) bearing.

NOTE: Only a small amount of oil is needed on each bearing. It is better to use too little oil rather than too much because less trouble will result. Oil on running surfaces between motor pulleys and rubber idlers may cause poor drive or no drive, as well as excessive wow and flutter.

Schematic Circuit Diagram for T-210 Series Tape Transports



HEAD CONNECTIONS, MODEL T-210 (REAR VIEW)



HEAD CONNECTIONS MODEL T-213 (REAR VIEW)

MODEL T-211 SAME BUT WITHOUT ERASE HEADS

MODEL T-212 SAME BUT WITH CHANNEL NO. 1 ERASE HEAD ONLY.

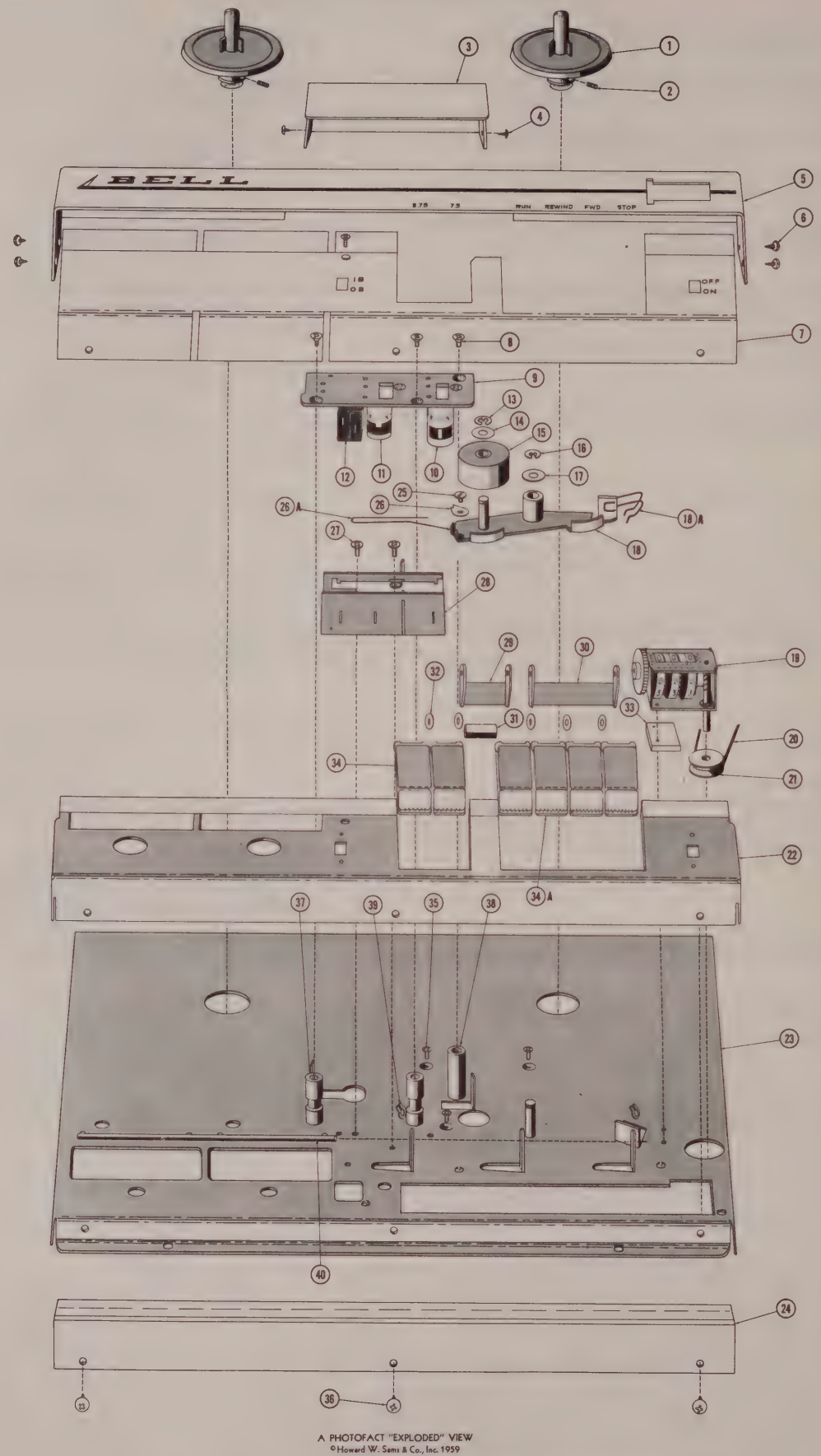


FIG. 4A EXPLODED VIEW OF PARTS ABOVE BASEPLATE

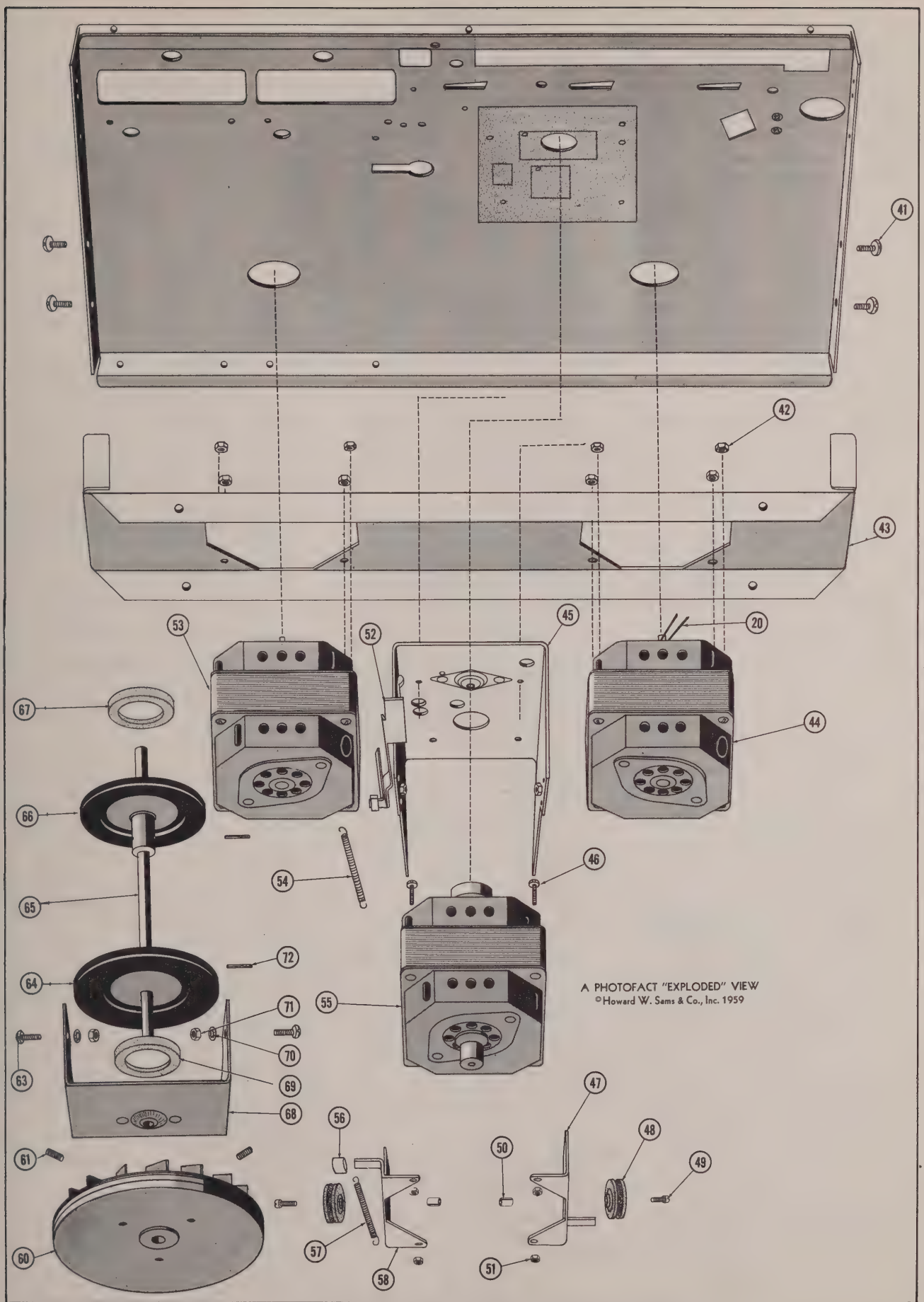


FIG. 4B EXPLODED VIEW OF PARTS BELOW BASEPLATE

CLEANING

Capstan shaft, pressure roller (15), support guide post (37), support post (38), record-playback head (10), record-playback tape head (11), and erase tape head (12) may accumulate tape coating oxide, worn off tape as it passes these parts. All of these parts except pressure roller (15) can be cleaned with head cleaning solvent, alcohol, or carbon tetrachloride.

Clean pressure roller (15) with alcohol or water only. Never clean any rubber driving surfaces with carbon tetrachloride.

CAUTION: Never use a metal tool to clean record-playback head (10), record-playback tape head (11), or erase tape head (12).

TROUBLE CHART

Symptom	Cause	Remedy
Poor tape drive in Play and Record.	1. Oil or grease on driving surfaces of drive pulley (64) or (66) and on upper pulley on capstan motor (55).	1. See "Cleaning."
	2. Oil, grease, or tape coating oxide on pressure roller (15) and on upper portion of capstan shaft will cause poor tape drive in both 3 3/4-and 7 1/2 ips speeds.	2. Clean with water or alcohol, as described under "Cleaning."
	3. Motor spring (57) disconnected or missing. There will be no tape drive in 7 1/2-ips position if this spring is disconnected or missing.	3. Replace motor spring (57).
	4. Motor spring (54) disconnected or missing. There will be no tape drive in 3 3/4-ips position if this spring is disconnected or missing.	4. Replace motor spring (54).
Take-up reel will not take up tape in Play or Record.	1. Set screw (2) in reel platform(1) loose, causing reel platform(1)to slip on motor shaft.	1. Tighten set screw (2).
Will not rewind.	1. Set screw (2) in supply reel platform loose, causing reel platform to slip on rewind motor shaft.	1. Tighten set screw (2).
Tape rubs on edge of reels.	1. Reel platforms misadjusted.	1. See "Reel Platform" under "Mechanical Adjustments.
	2. Rewind-take-up motor mounting bracket loose.	2. Tighten the two screws on each end of deck plate.
Tape spills during Rewind or Fast Forward.	1. Memory switch out of adjustment.	1. Remove tape transport electrical chassis cover. Place memory switch so that it will position itself one way when Rewind key is depressed and the other way when Forward key is depressed.

TROUBLE CHART (CON'T.)

Symptom	Cause	Remedy
Dynamic Brakes do not function properly.	1. Weak selenium rectifier.	1. Replace selenium rectifier.
	2. R55 or R56 open.	2. Replace R55 or R56.
	3. Going from Rewind to Stop the tape spills from the take-up reel; R55 open.	3. Replace R55.
	4. Going from Fast Forward to Stop, the tape spills from the rewind reel; R56 open.	4. Replace R56.

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description
1	83B10	Reel Platform
2		Set Screw, Stl. Pl. 8-32 x 3/16 Cup Pt.
3	72B31	Head Cover
4		Screw
5	72C32	Cover Plate
6		Screws
7	72C90	Decorative Panel (Gold) T-200 Series
	72C34	Decorative Panel (Gold) T-210 Series
8		6-32 x 3/8 PH. FHMS. STL. PL. Screws
9	71A13	Head Support Plate
10	36B1	Stacked 2-Channel Record-Playback Head (T-201, T-202, T-203, T-211, T-212, and T-213)
11	36B6	Record-Playback Tape Head (T-200, T-201, T-202, T-203, and T-210)
12	36B4	Dual Erase Tape Head (T-203 and T-213)
	36B5	Single Erase Tape Head (T-200, T-202, T-210, and T-212)
13	A23822	Retaining Ring
14	B20089P71	Felt Washer
15	83A4	Pressure Roller
16	A23822	Retaining Ring
17	B20089P71	Felt Washer
18	91A40	Pressure Roller Actuator Ass'y
18A	77A11	Actuator Arm Spring
19	46B1	Program Indicator
20	83A19	Counter Drive Belt
21		Part of Item 19
22	72D37	Deck Control Panel
23	72D35	Deck Chassis
24	78B97	Trim Strip
25		Screw
26		Retainer
26A	77A9	Toggle Spring
27		Screw
28	91B46	Pressure Pad Ass'y.
29	72A66	Key Coupler (Short)
30	72A65	Key Coupler (Long)

Ref. No.	Part No.	Description
31	75A9	Key Spacer
32		Washer
33	71A19	Counter Mtg. Plate
34	83A12	Modified Key (3 3/4 ips only)
34A	83A9	Piano Key
35		Screw
36		Trim Strip Screw
37	75A6	Support Guide Post
38	75A7	Support Post
39		Grip Ring
40	76A2	Key Shaft
41		Motor Mtg. Bracket Screws
42		6-32 Hex Nut
43	72C135	Motor Mtg. Bracket
44	35B6	Take-up Motor
45		Capstan Motor Housing
46		Capstan Motor Mtg. Screws
47	A25382	Capstan Motor Support
48	B20029P41	Grommet
49		6-32x3/8 Fil. Hd. Mach. Screw
50	B20025P23	Spacer
51		Hex Nut
52	A25392	Capstan Lever
53	35B7	Rewind Motor
54	A25397P1	Motor Spring
55	91B99	Capstan Motor Ass'y.
56	83A26	Rubber Bumper (2)
57	A25397P2	Motor Spring
58	A25382	Capstan Motor Support
60	A25257	Flywheel
61		Set Screw
63		#8-32x3/8 Phillips Hd. Mach. Screw
64	A25396P2	Drive Pulley, 3 3/4
65	76A3	Capstan Shaft
66	A25396P1	Drive Pulley, 7 1/2
67	A25405P2	Felt Washer
68	B25381	Capstan Yoke
69	A25405P2	Felt Washer
70		Lockwasher
71		#8-32 Hex Nut
72		Roll Pin

P100 PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	AF Amp. -Cath. Follower	12AX7/ ECC83
V2	AF Amplifier	12AU7/ ECC82

ITEM No.	USE	TYPE
V3	Rectifier	6V4/ EZ80

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA Bell Sound PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	20	300	23B22	PRS450V2020	BBRD2245	TCD65	TDLD-28	TVA-2730	
B	20	300							
C2A	150	25	23B16	PR3-010	BBRT0126.5			TVAS-3395*	
B	150	25							
C	150	25							
C3	10	300	23B20	PRS350V10	BR1045	TC62	TD-10-450	TVA-1604	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA Bell Sound PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	470		10%			DD-471		JL-347	5GA-T47S 10%	
C5	10000				BPD-01	DD-103	BYA10S1	B1-110	5GA-S1	
C6	1500		10%					JL-215	5GA-D15S 10%	
C7	.05	400			P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C8	.5	200			P288N-5		CUB2P5	GEM-205	2TM-P5	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA Bell Sound PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1 A	250K	½	15B6	B-51	A47-250K-Z	Q13-130	U44	Gain
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	Bell Sound PART No.	NOTES
R2	10K			
R3	100K			
R4	2200Ω			
R5	51K 5%			
R6	2.2meg			
R7	100K			
R8	82K			
R9	1000Ω			

ITEM No.	RATING OHMS	RATING WATT	Bell Sound PART No.	NOTES
R10	470K			
R11	27K			
R12	27K			
R13	10K			
R14	15Ω	1		
R15	15Ω	1		
R16	15Ω	1		

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA Bell Sound PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .16A	260 VCT @ .004A	16.5V @ .130A	32B2A						
	SEC. 3	SEC. 4	SEC. 5							
	6.3 VCT @ .8A									

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT (Measured)	REPLACEMENT DATA Bell Sound PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	NOTES
M1	.130A	42B2	1016	B1B	304B	

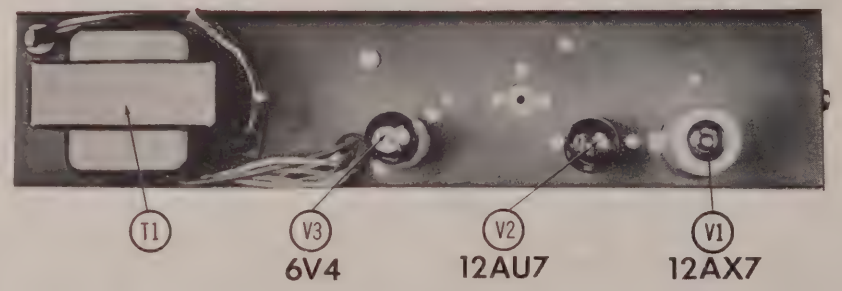
MISCELLANEOUS

ITEM No.	PART NAME	Bell Sound PART No.	NOTES
M2	Lamp	B20044P17	#47

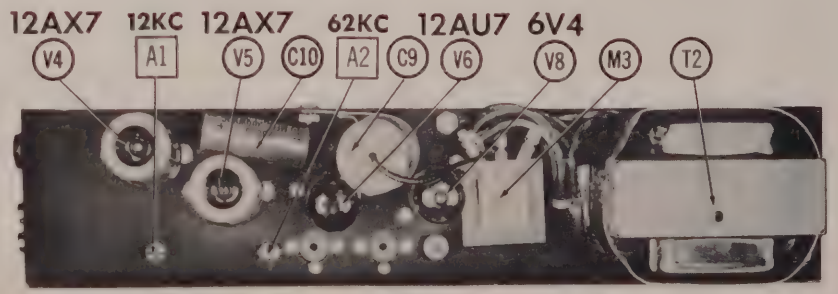
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

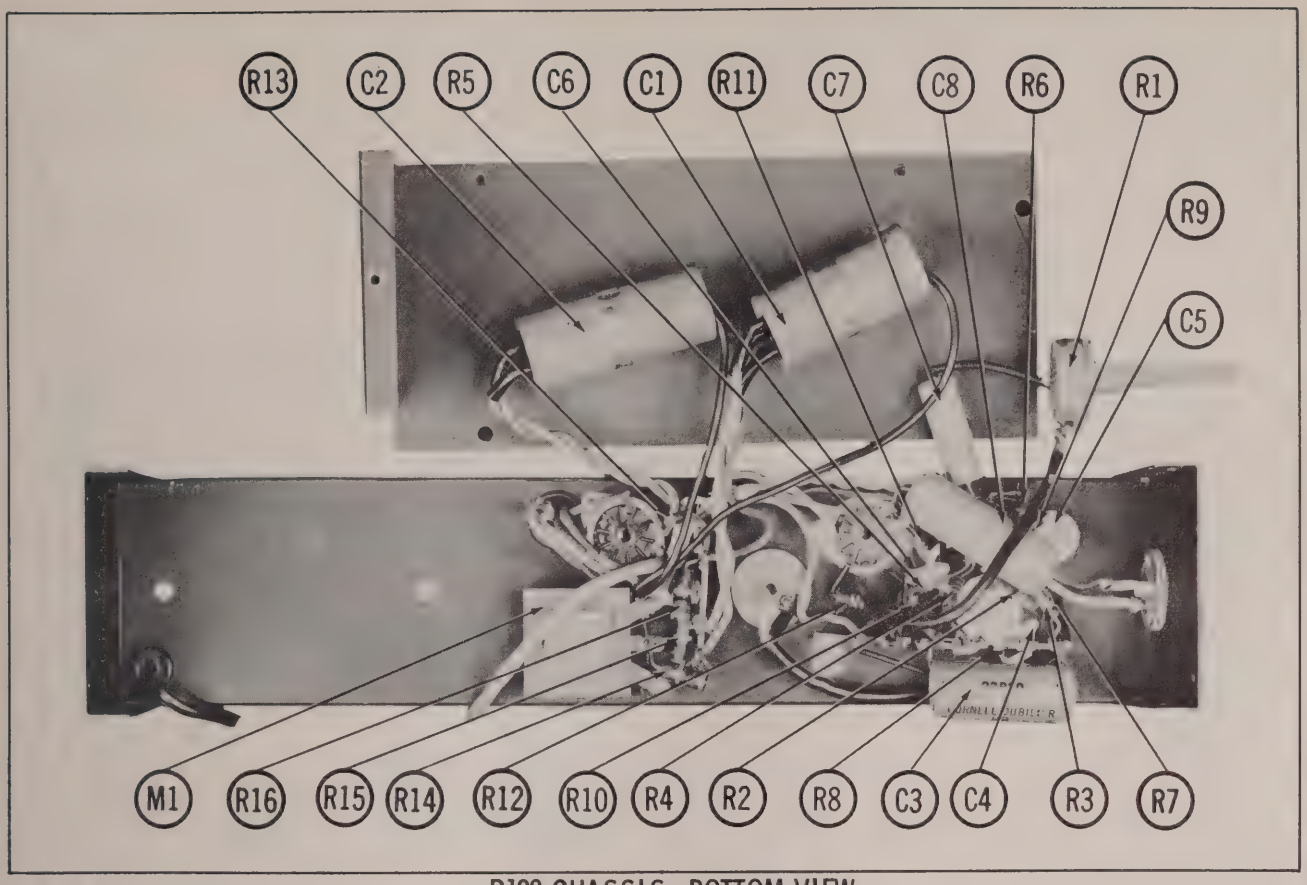
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)



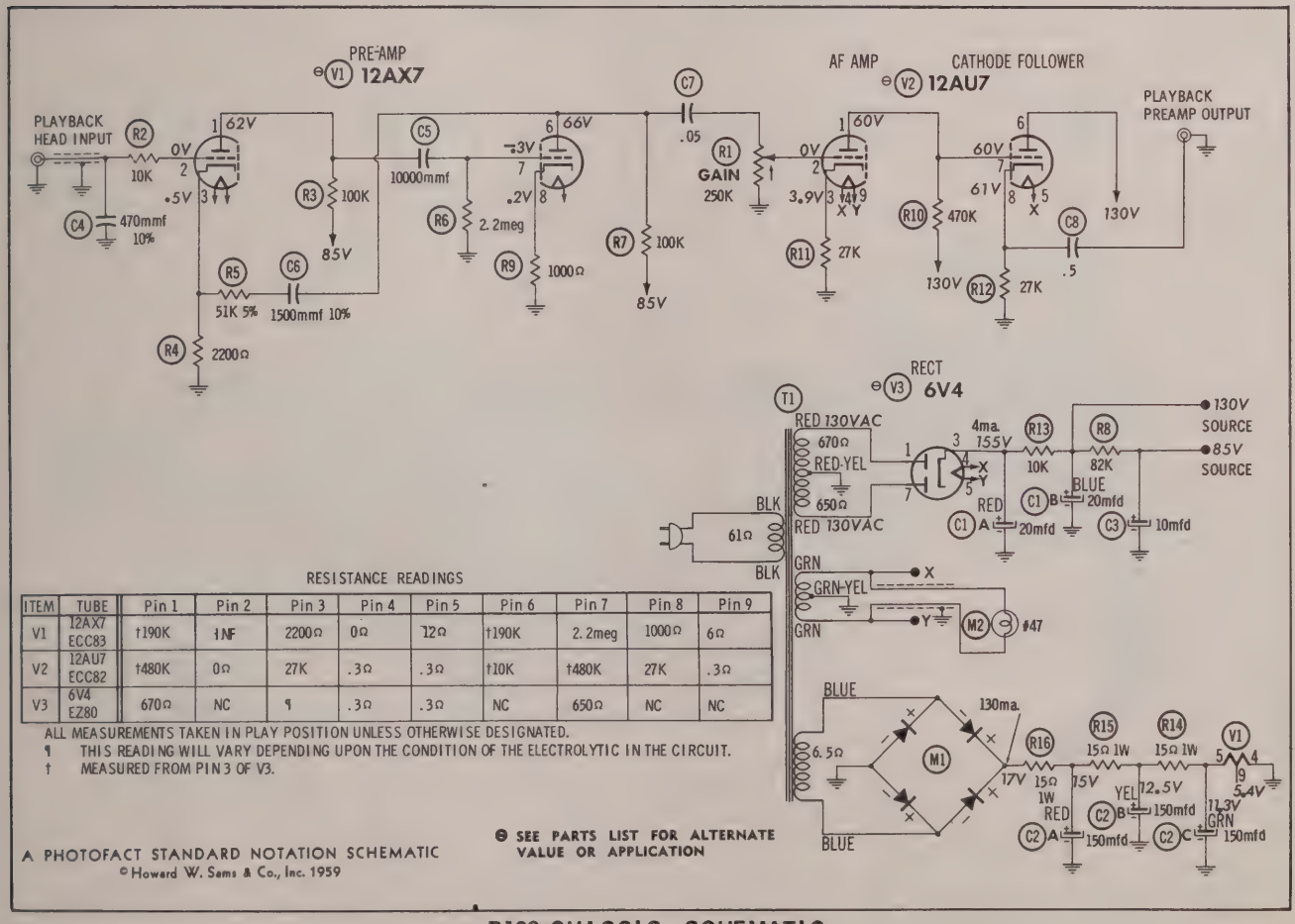
P100 CHASSIS-TOP VIEW



RP120 CHASSIS-TOP VIEW



P100 CHASSIS - BOTTOM VIEW



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7 ECC83	†190K	‡NF	2200Ω	0Ω	12Ω	†190K	2.2meg	1000Ω	6Ω
V2	12AU7 ECC82	†480K	0Ω	27K	.3Ω	.3Ω	†10K	†480K	27K	.3Ω
V3	6V4 EZ80	670Ω	NC	¶	.3Ω	.3Ω	NC	650Ω	NC	NC

ALL MEASUREMENTS TAKEN IN PLAY POSITION UNLESS OTHERWISE DESIGNATED.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 3 OF V3.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

P100 CHASSIS - SCHEMATIC

RP120 PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V4	Preamplifier	12AX7/ECC83
V5	AF Amplifier	12AX7/ECC83
V6	Cath. Follower - Bias Osc.	12AU7/ECC82
V7	Record Level Indicator	1M3/DM70
V8	Rectifier	6V4/EZ80

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	Bell Sound PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C9A	20	350	23B15	PR4-175	BBRQ0695.3		CDB-Q-1003	TVAS-3627*	
B	20	350							
C	10	350							
C10	10	300	23B20	PRS350V10	BR1045	TC62	TD-10-450	TVA-1604	
C11A	150	25	23B26						
B	150	25							
C	150	25							
C12	20	6	23B18	XPP-6020	NL20-6	TT15X20	ML20-6	TE-1090	
C13	5	50	23B24	PRS50V5	BBR5-50	TT50X5	TD-5-50	TVA-1303	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	Bell Sound PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C14	1000		10%					JL-210	5HK-D1S 10%	
C15	390	400	5%				5R5T39		MS-339	
C16	470		10%			DD-471		JL-347	5GA-T47S 10%	
C17	470	400	5%		1467-00047		5R5T47		MS-347	
C18	150		10%		NPO-SI 150	DD-151	L10T15	JL-315	5GA-T15S 10%	
C19	3300		10%					JL-233	5HK-D33S 10%	
C20	.02	200			P288N-02	DD-203	CUB2S2	GEM-412	2TM-S2	
C21	2200		10%					JL-222	5HK-D22S 10%	
C22	.02	200			P288N-02	DD-203	CUB2S2	GEM-412	2TM-S2	
C23	.05	400			P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C24	.01	200			P288N-01	DD-103	CUB4S1	GEM-411	4TM-S1	
C25	1500		5%		1467-0015		1R5D15	MCE 255	MS-215	
C26	1500		10%					JL-215	5HK-D15S 10%	
C27	.5	200			P288N-5		CUB2P5	GEM-205	2TM-P5	
C28	5000				BPD-005	DD-502	BYA10D5	JL-250	5GA-D5	
C29	5000				BPD-005	DD-502	BYA10D5	JL-250	5GA-D5	
C30	150		10%		NPO-SI 150	DD-151	L10T15	JL-315	5GA-T15S 10%	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	Bell Sound PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R17A	Switch		18B1					Play-Record Level
B	250K	½			A47-250K-Z†	Q13-130†	U44 †	
C	Shaft				RS-3/16	NQ	DS-37	

† Use an extra mounting nut behind mounting surface.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	Bell Sound PART No.	NOTES
R18	100Ω			
R19	100K			
R20	2700Ω			
R21	10K			
R22	10K			
R23	620Ω 5%			
R24	10K			
R25	4.7meg			
R26	100K			
R27	2200Ω			
R28	2.2meg			
R29	100K			
R30	82K			
R31	47K 5%			

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	Bell Sound PART No.	NOTES
R32	390K			
R33	1000Ω			
R34	100K			
R35	3900Ω			
R36	130K 5%			
R37	470K			
R38	270K			
R39	22K			
R40	3900Ω			
R41	10K			
R42	22K			
R43	82K			
R44	150K			
R45	10meg			
R46	10K			
R47	560Ω			
R48	82Ω	1		
R49	15Ω	1		
R50	15Ω	1		
R51	15Ω	1		
R52	390Ω	1		
R53	3900Ω	3		

COILS (RF-IF)

ITEM No.	USE	Bell Sound PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	12KC Filter	31B9					Pri. Tapped @ 9Ω
L2	Bias Osc.	31B10					

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	Bell Sound PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	117V @ .27A	480 VCT @ .020A	23.5V @ .165A	32B3						
	SEC. 3	SEC. 4	SEC. 5							
	6.3 VCT @ 1.2A									

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT (Measured)	Bell Sound PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	NOTES
M3	.165A	42B2	1016	B1B	304B	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	Bell Sound PART No.	CBS PART No.	SYLVANIA PART No.	NOTES
M4	1N60		1N60	1N295	
M5	1N60		1N60	1N295	

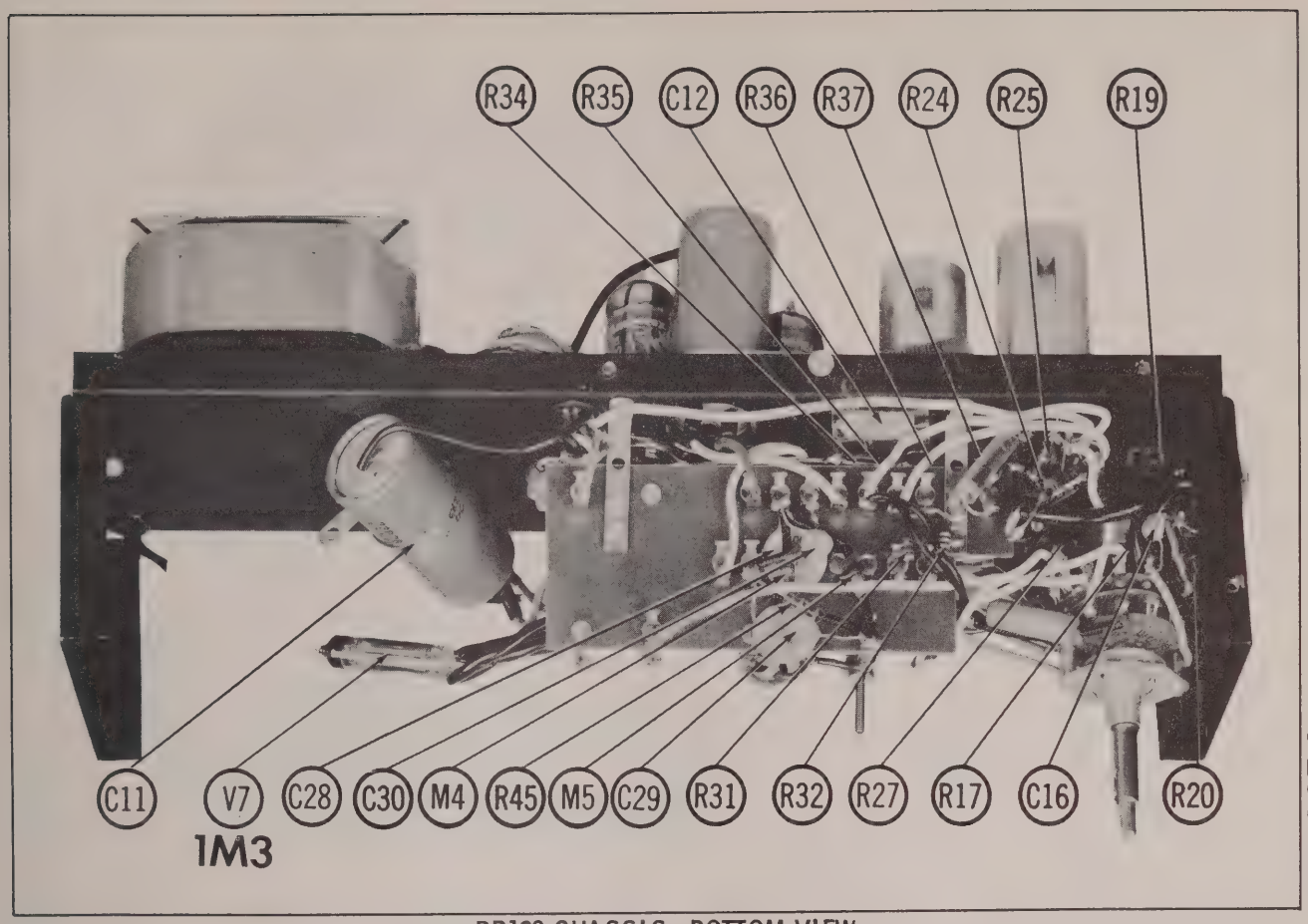
MISCELLANEOUS

ITEM No.	PART NAME	Bell Sound PART No.	NOTES
M6	Lamp	B20044P17	#47
M7	Lamp	B20044P17	#47

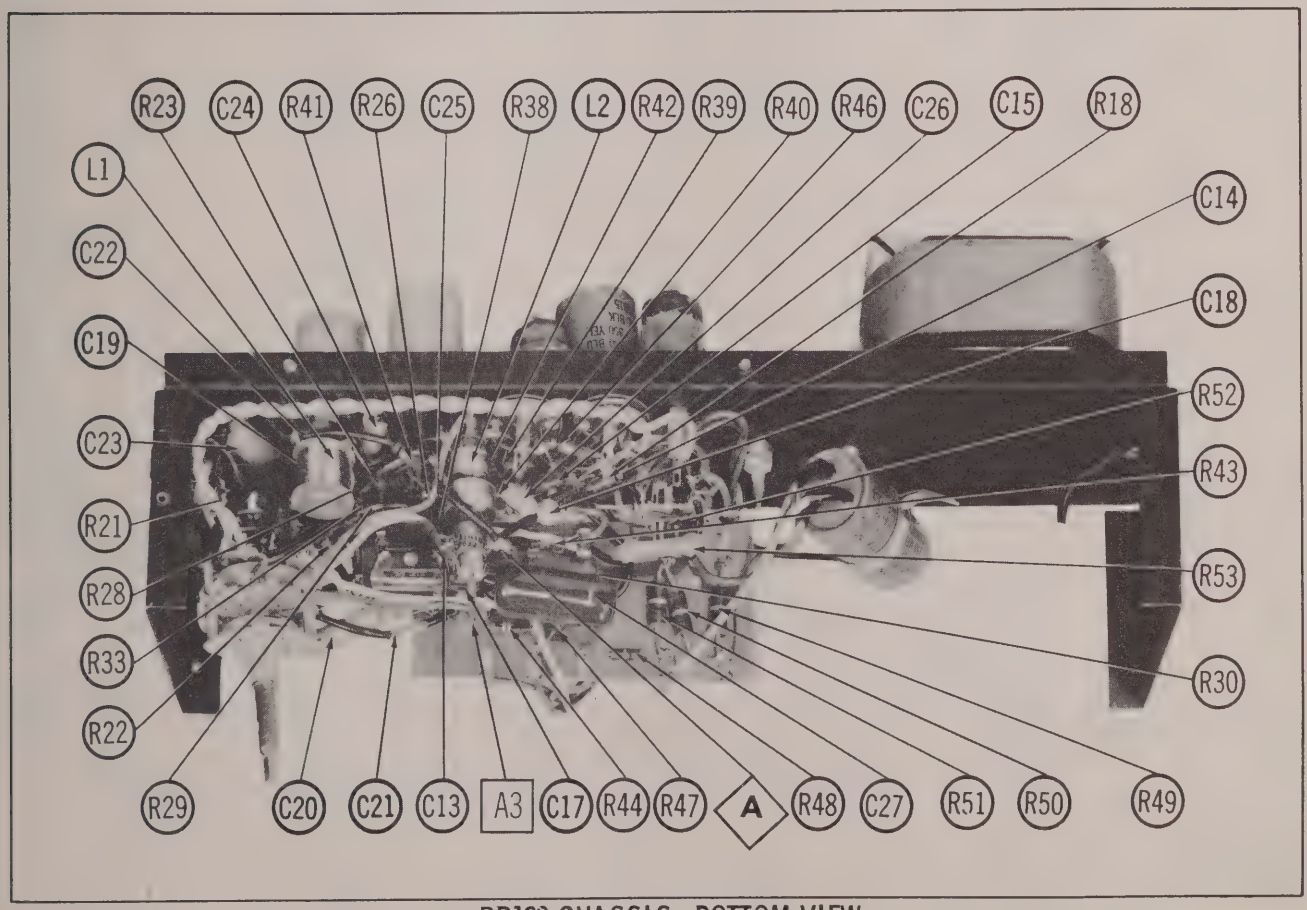
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

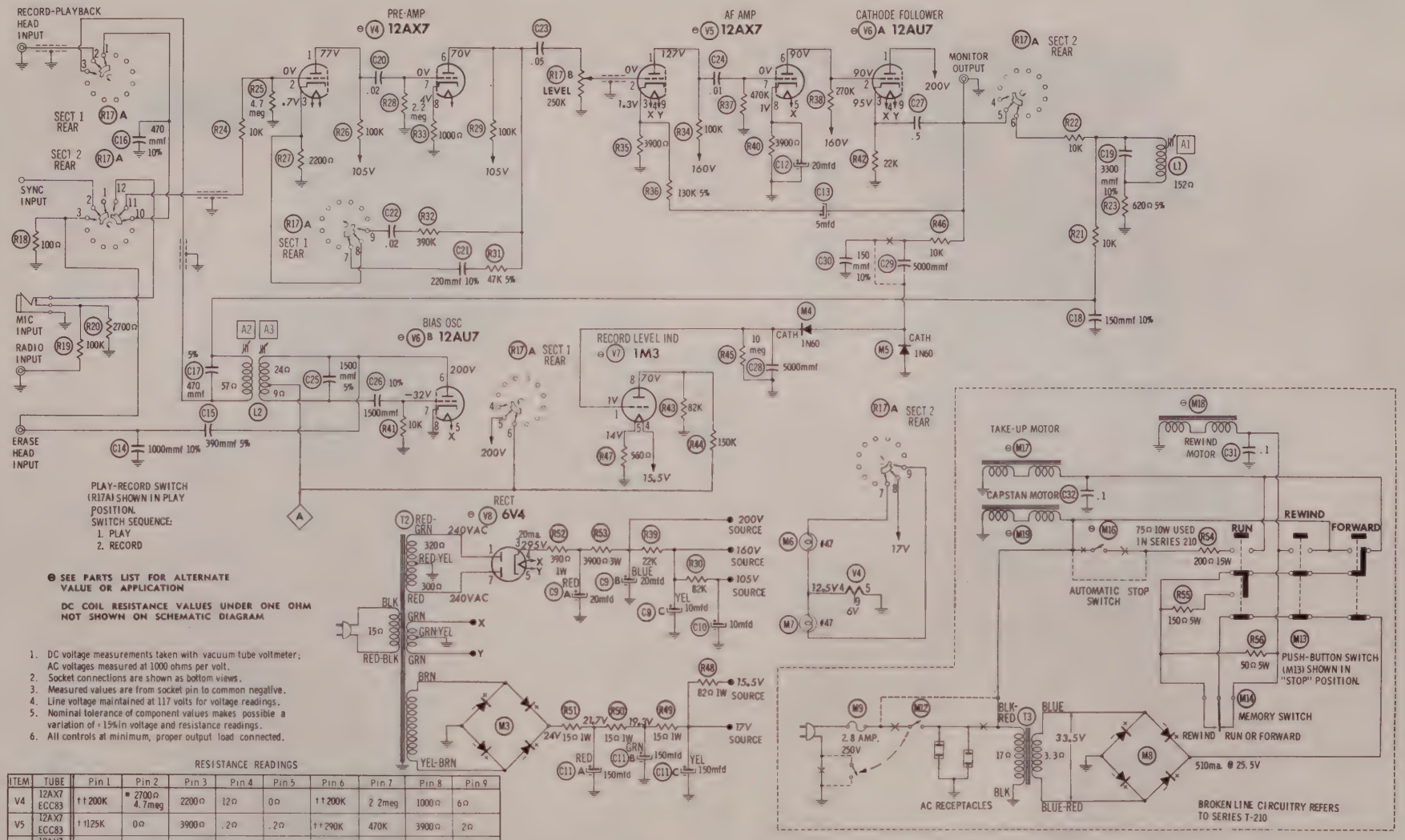
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)



RP120 CHASSIS - BOTTOM VIEW



RP120 CHASSIS - BOTTOM VIEW



⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V4	12AX7 ECC83	††200K	• 2700Ω 4.7meg	2200Ω	12Ω	0Ω	††200K	2 2meg	1000Ω	6Ω
V5	12AX7 ECC83	†1125K	0Ω	3900Ω	.2Ω	.2Ω	††290K	470K	3900Ω	2Ω
V6	12AU7 ECC82	††3900Ω	†1290K	22K	.2Ω	.2Ω	††3900Ω	10K	0Ω	.2Ω
V7	1M3 DM70	10meg	NC	NC	77Ω	90Ω	NC	NC	†1110K	
V8	6V4 EZ80	320Ω	NC	¶	.2Ω	.2Ω	NC	300Ω	NC	TP

ALL MEASUREMENTS TAKEN IN "PLAY" POSITION UNLESS OTHERWISE DESIGNATED.
¶ READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
†† MEASURED FROM PIN 3 OF V8. • MEASURED IN "RECORD" POSITION.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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BELL SOUND MODELS T-200 Series, T-210 Series

RP120 & T200 CHASSIS - SCHEMATIC

PARTS LIST AND DESCRIPTIONS

T200

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	Bell Sound PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C31	.1	600		B20047P95	P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C32	.1	600		B20047P95	P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Bell Sound PART No.	NOTES
	OHMS	WATT		
R54	200Ω	15		
R55	150Ω	5	B20256P16	

ITEM No.	RATING		Bell Sound PART No.	NOTES
	OHMS	WATT		
R56	50Ω	5	B20256P15	

TRANSFORMER

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	Bell Sound PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T3	117V @ .21A	33.5V @ .510A		32B1				RT-201 ①		

① Drill new mounting holes.

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	Bell Sound PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M8	.510A	B20107P10		C1B15DELX	4N33-1B1-RV	

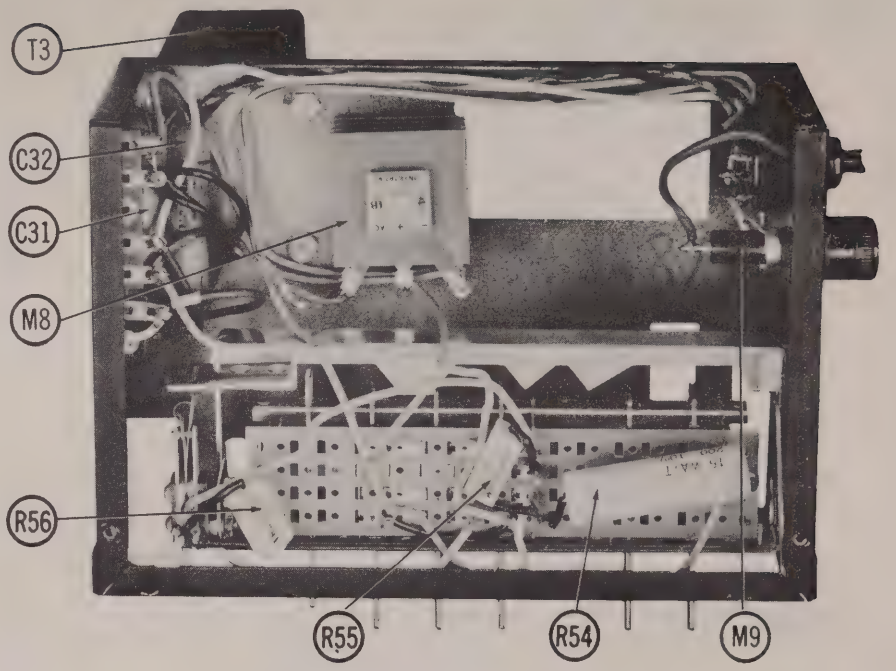
FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Bell Sound PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M9	MDL	2.8A 250V S/B	53X3	B20001P13	31302.5 (2.5A 125V S/B)	342001	MDL 2 8/10	HKP

MISCELLANEOUS

ITEM No.	PART NAME	Bell Sound PART No.	NOTES
M10	Head	36B4	Dual Erase, Models T-203, T-213
M11	Head	36B5	Single Erase, Models T-200, T-202, T-210, T-211, T-212
	Head	36B6	Record-Playback, Models T-200, T-201, T-202, T-203, T-210
	Head	36B1	Stacked 2 Channel, Models T-201, T-202, T-203, T-211, T-212 T-213
M12	Switch	43A7	Power On-Off, SPST (Slide Type)
M13	Switch	43C5	Run, Rewind-Forward (Push Button Type)
M14	Switch	A25342	Memory, DPDT (Slide Type)
M15	Switch	43A8	IB-OB, DPDT, T-200 Series Only
M16	Switch	43A36	Automatic Stop, SPST
M17	Motor	35B4	Takeup, General Industries
	Motor	35B6	Takeup, General Industries, 50 Cycle
	Motor	35C8	Takeup, Alliance
M18	Motor	35B5	Rewind, General Industries
	Motor	35B8	Rewind, Alliance
	Motor	35B7	Rewind, General Industries, 50 Cycle
M19	Motor	91B53	Capstan, General Industries
	Motor	91C159	Capstan, Alliance
	Motor	91B199	Capstan, 50 Cycle

CHASSIS-BOTTOM VIEW



CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

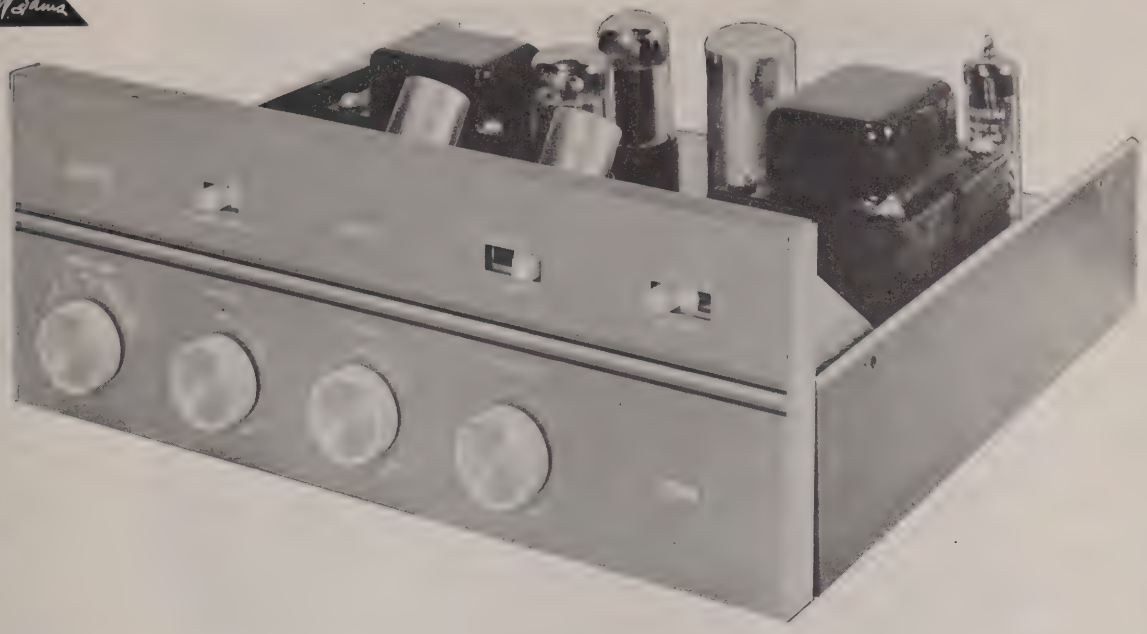
NAME	PART NO.	DESCRIPTION
Knob	84A2	Model P-100
Knob	84A3	Outer, Model RP-120
Knob	84A4	Inner, Model RP-120
Key	83A9	Piano (Grey), 5 Used
Key	83A12	Modified (3 3/4 ips only)
Key	91A118	Assembly, Modified
Key	91A117	Assembly, Standard
Cover	72B31	Head
Cover	72C54	Decorative, Models T-201, T-202, T-203, T-206, T-208, T-211, T-212, T-213, T-216
Cover	72B36	Deck Chassis
Panel	91B122	Decorative, Includes Cushion Assembly, Models T-201, T-202, T-203
Panel	91B121	Decorative, Includes Cushion Assembly, Models T-200; T-210 Series
Panel	91B123	Decorative, Includes Cushion Assembly, Model T-206
Panel	72C34	Decorative (Gold)
Panel	72D37	Deck Control
Panel	91C51	Control, Assembly, Models T-202, T-203, T-206
Panel	91C60	Control, Assembly, Models T-200, T-201; T-210 Series
Indicator	46B1	Program (Index Counter)
Dial Panel	83D5	Model RP-120
Dial Panel	83D6	Model P-100

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

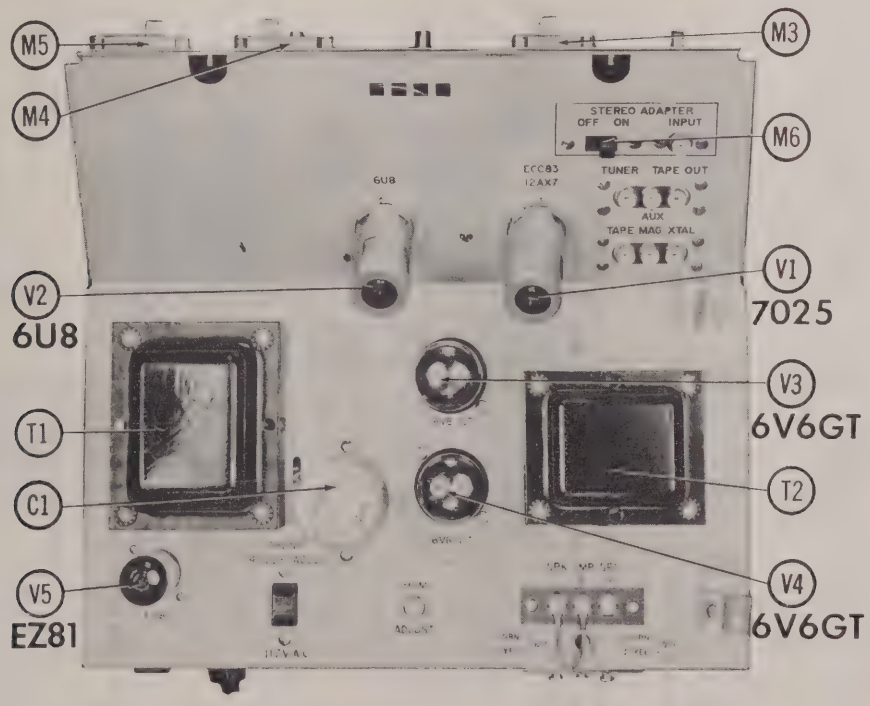
DAVID BOGEN
MODEL DB114

DAVID BOGEN
MODEL DB114



TRADE NAME	David Bogen Model DB114
MANUFACTURER	David Bogen Co., P. O. Box 500, Paramus, N. J.
TYPE SET	AC Operated 7 Channel Audio Amplifier
TUBES	Five
POWER SUPPLY	110 - 120 Volts AC, 60 Cycles RATING 63 Watts, .655 Amp. @117 Volts AC

DAVID BOGEN
MODEL DB114



HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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H902

SET 437 FOLDER 4

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Pre Amplifier	7025	①
V2	AF Amp. -Phase Inv.	6U8	
V3	Output	6V6GT	
V4	Output	6V6GT	
V5	Rectifier	EZ81/ 6CA4	

① Some versions may use ECC83/12AX7 in this application.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA David Bogen PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	▲20	450	C541	AFH4-90	D0120	FP474.5	TMQ-11	TVLS-4716.5*	
B	■20	450			BR1045		TD-10-450		
C	▲10	350							
D	10	350							
C2	5	200	C232	PRS250V4	BBR4-250	TC50X	TD-4-250	TVA-1501	
C3	5	200	C232	PRS250V4	BBR4-250	TC50X	TD-4-250	TVA-1501	
C4	50	50	C229	PRS50V50	BR505	TC39	TD-50-50	TVA-1308	

*Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C5	68		10%		NPO-DI 68	DTZ-68	C10Q68C		5TCC-Q68	
C6	.022	200			P288N-022	DD-203	CUB2S22	GEM-4122	2TM-S22	
C7	1800		10%				1R5D18		MS-218	
C8	.022	200			P288N-022	DD-203	CUB2S22	GEM-4122	2TM-S22	
C9	.0068	200			P288N-0068	D6-682	CUB6D68	GEM-6268	6TM-D68	
C10	.022	200			P288N-022	DD-203	CUB2S22	GEM-4122	2TM-S22	
C11	4700		10%				1R5D47		MS-247	
C12	4700		10%							
C13	470		10%			D6-471	5R5T47		MS-347	
C14	1800		10%				1R5D18		MS-218	
C15	680		10%			D6-681	1R5T68		MS-368	
C16	3300		10%				1R5D33		MS-233	
C17	1.2									①
C18	12		NPO 10%				C10Q12C			②
C19	10		10%		NPO-DI 10	DD-100	L10Q1	ZT-541	5TCC-Q1	
C20	10		10%		NPO-DI 10	DD-100	L10Q1	ZT-541	5TCC-Q1	
C21	.22	200			P288N-22		CUB2P22	GEM-2122	2TM-S22	
C22	.25	200			P288N-25		CUB2P25	GEM-2125	2TM-S25	②
C23	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C24	470					D6-471	5R5T47		MS-347	
C25	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C26	.047	400			P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	

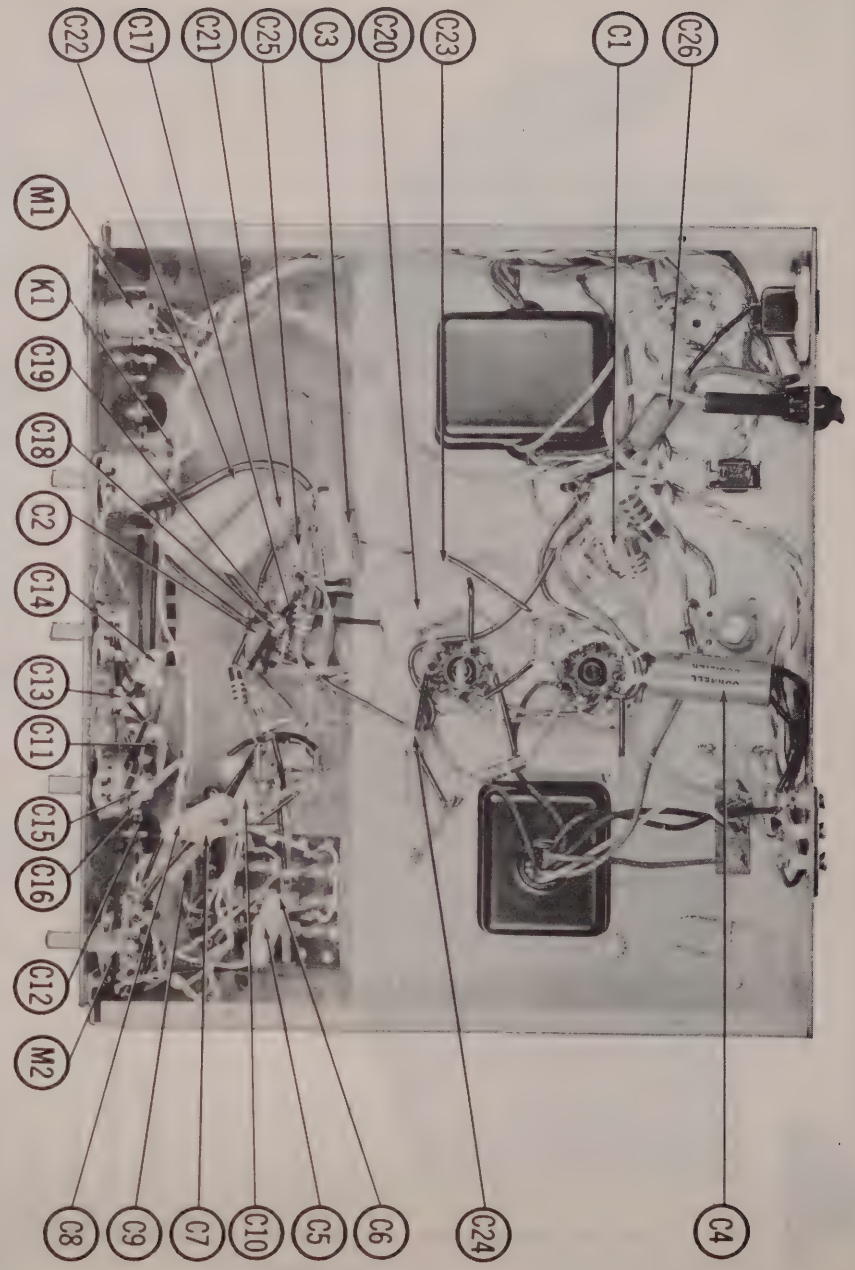
① Some versions may use 33mmf in this application.
② Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA David Bogen PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500K	½	V377	B-60	A47-500K-Z	Q13-133	U48	Volume
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
C	Switch			KB-1 or KR-1*	SWE-12	76-1	US-26	
R2A	500K	½	V424	B-60	A47-500K-Z	Q13-133	U48	Treble
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R3A	500K	½	V424	B-60	A47-500K-Z	Q13-133	U48	Bass
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R4A	50Ω	2(WW)	V113A	WN-50	A43-50	W11-050	R50L	Hum Adjust
B	Shaft			Not Req.	FKS-1/4	SK5	Not Req.	

* Use KR with CRL "Red Label" controls and KB with "Blue Label" controls.

CHASSIS-BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	David Bogen PART No.	NOTES
R5	3.3meg			
R6	100K			
R7	100K			
R8	47K			
R9	22K			
R10	3.3meg			
R11	4.7meg			
R12	220K			
R13	150K			
R14	750K 5%			
R15	220K			
R16	56K			
R17	22K			①
R18	470K			
R19	82K			
R20	150K	1		②

ITEM No.	RATING OHMS	RATING WATT	David Bogen PART No.	NOTES
R21	390Ω			③
R22	150K			
R23	110K 5%			
R24	390K			
R25	33K			
R26	2.7Ω	1		
R27	470K			
R28	47K			
R29	33K	4		
R30	6800Ω	2		
R31	1200Ω	1		
R32	470K			
R33	47K			
R34	325Ω	7		
R35	3300Ω			
R36	33K	1		

① Some versions may use 10K in this application.
② Some versions may use 270K in this application.
③ Some versions may use 470Ω in this application.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA David Bogen PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ⓐ .655A	710 VCT ⓐ .080A	6.3V ⓐ 2.7A	83-568	P9311	P-2952		PM8409	24R04	R-11B

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA David Bogen PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	10K CT	16Ω Tap ⓐ 8Ω, 4Ω	83-230-010	Z1405 ①			A-3304 ①	22S93 ①	S-31A ①	① Use original shields

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	David Bogen PART No.	REPLACEMENT DATA
K1	Tone Compensation	150mmf, 10000mmf, 27K, 47K, 150K	C421	Sprague TC-8

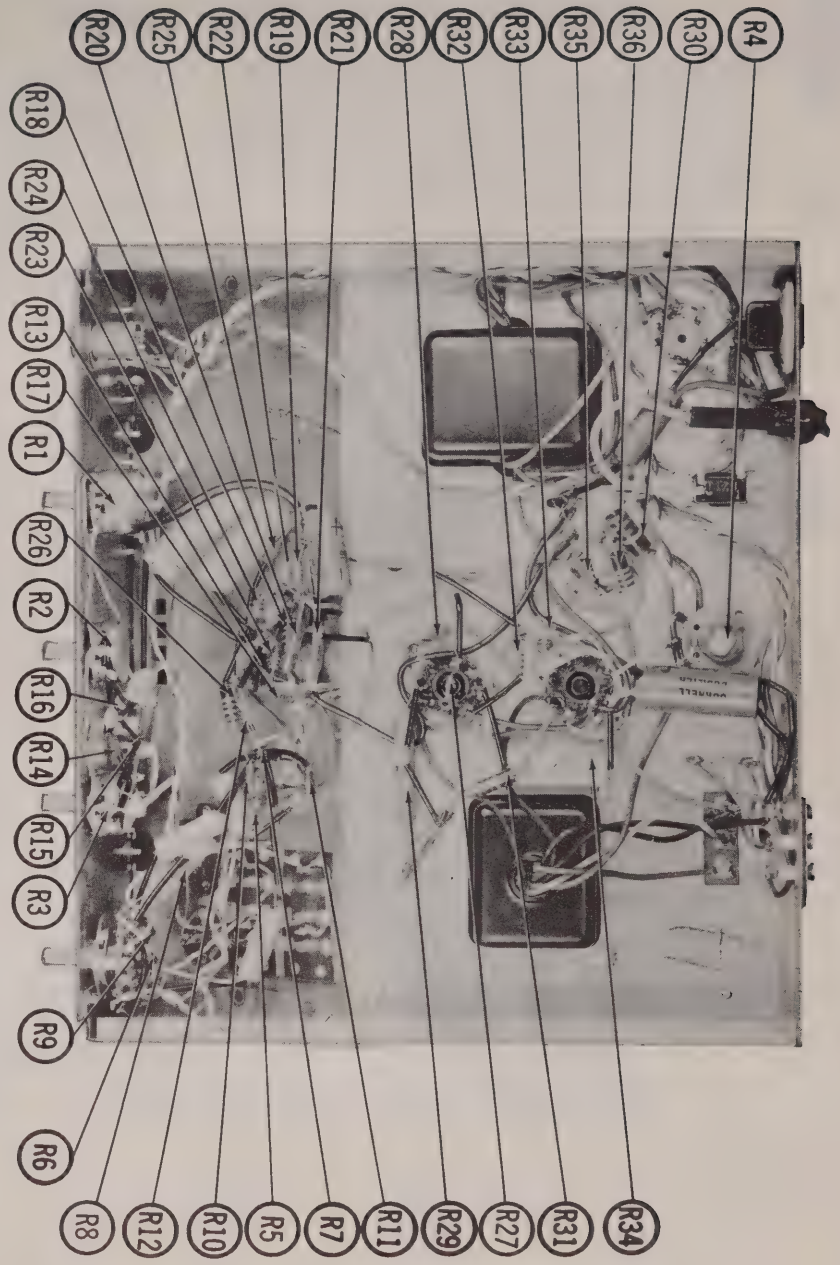
MISCELLANEOUS

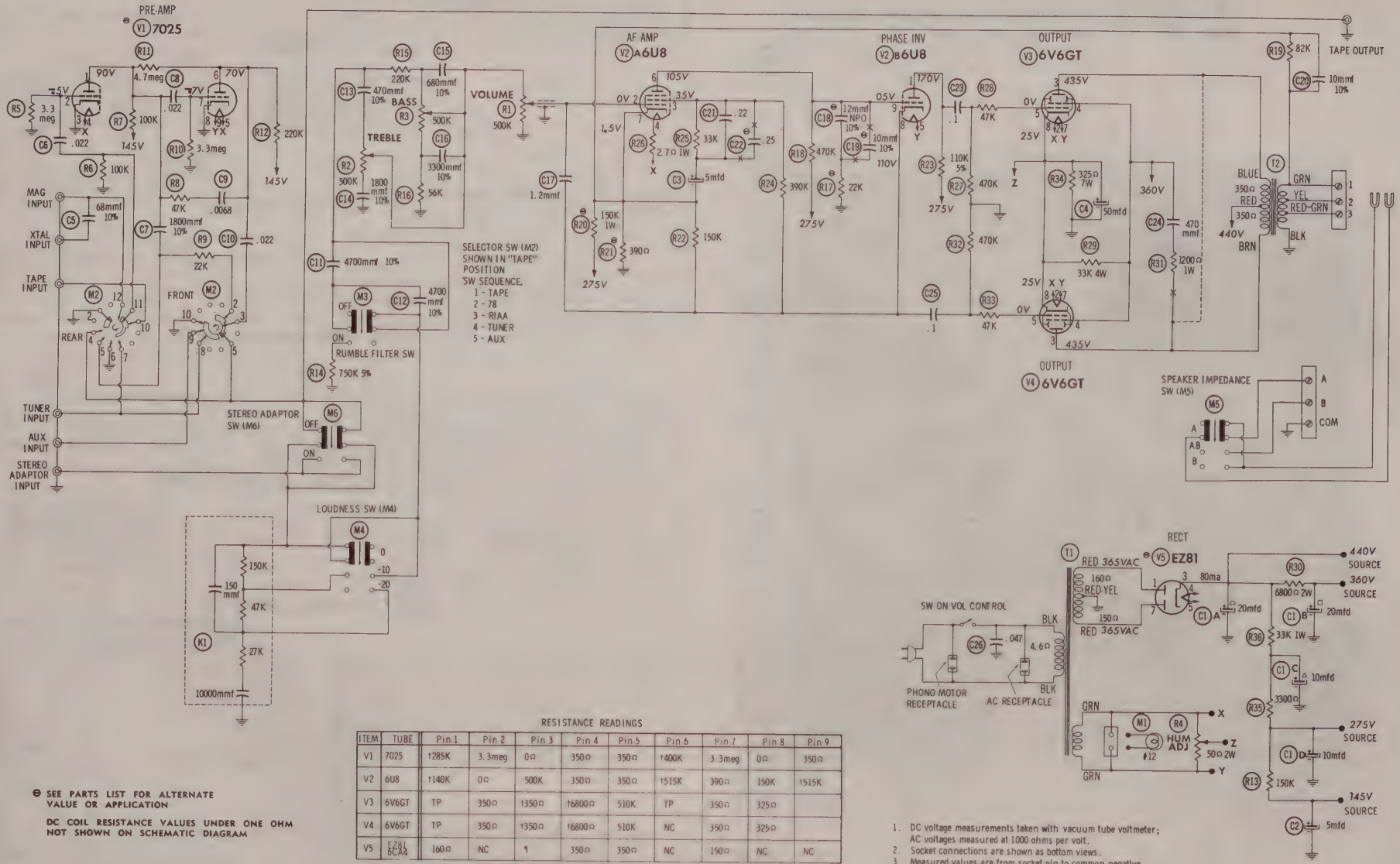
ITEM No.	PART NAME	David Bogen PART No.	NOTES
M1	Lamp	H639	#12
M2	Switch	S506	Selector (5Position, Rotary, Wafer Type)
M3	Switch	S514	Rumble Filter (DPST, Slide Type)
M4	Switch	S515	Loudness (3Position, Slide Type)
M5	Switch	S515	Speaker A-AB-B (Slide Type)
M6	Switch	S514	Stereo On-Off (SPDT, Slide Type)

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

CHASSIS—BOTTOM VIEW





RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	7025	†285K	3.3meg	0Ω	350Ω	350Ω	†400K	3.3meg	0Ω	350Ω
V2	6U8	†140K	0Ω	500K	350Ω	350Ω	†515K	390Ω	150K	†515K
V3	6V6GT	TP	350Ω	†350Ω	†6800Ω	510K	TP	350Ω	325Ω	
V4	6V6GT	TP	350Ω	†350Ω	†6800Ω	510K	NC	350Ω	325Ω	
V5	EZ81 6CA4	160Ω	NC	¶	350Ω	350Ω	NC	150Ω	NC	NC

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 3 OF V5.
NC NO CONNECTION
TP TIE POINT

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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DAVID BOGEN
MODEL DB114

PHOTOFACT* Folder

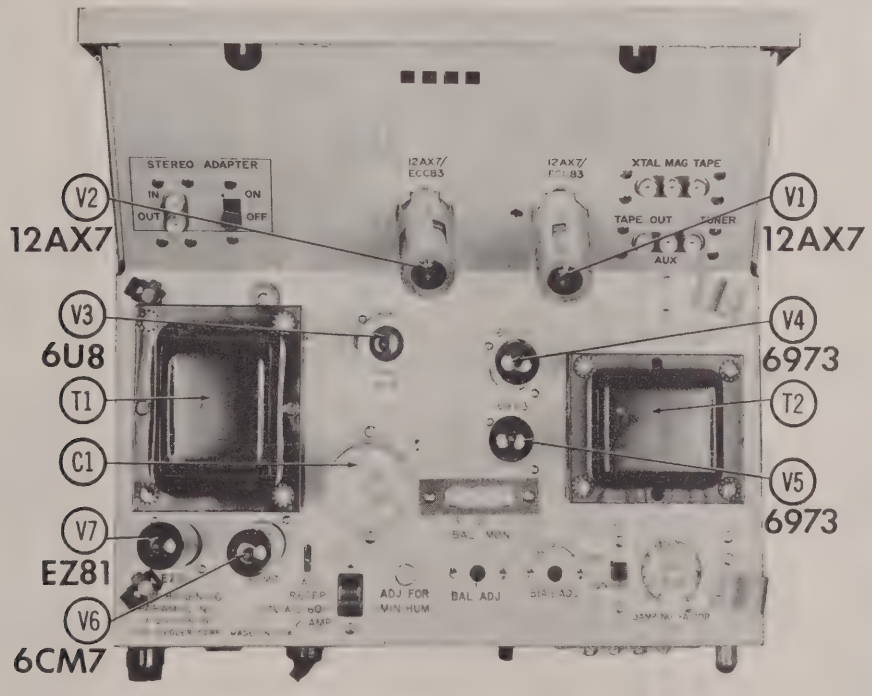
EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

DAVID BOGEN
MODEL DB125

DAVID BOGEN
MODEL DB125

TRADE NAME	David Bogen Model DB125
MANUFACTURER	David Bogen Co., P. O. Box 500, Paramus, N. J.
TYPE SET	AC Operated 5 Channel Audio Amplifier
TUBES	Seven
POWER SUPPLY	110 - 120 Volts AC, 60 Cycles RATING 50 Watts, .52 Amp. @117 Volts AC

DAVID BOGEN
MODEL DB125



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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	Preamplifier	ECC83/12AX7
V2	Cath. Follower-AF Amp.	ECC83/12AX7
V3	AF Amp. -Phase Inv.	6U8A
V4	Output	6973

ITEM No.	USE	TYPE
V5	Output	6973
V6	Voltage Regulator	6CM7
V7	Rectifier	EZ81/6CA4

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	David Bogen PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	▲20	500	C-554		C0270	FP376.5	TMT-34	T-805	TVLS-4915.5*
B	■20	400			BR2050	TC83	TD-20-500	MTD-4520	
C	▲20	350							
D	20	300							
C2	50	100	C-231	PRS150V50	BR5015	TC49	TD-50-150	MT-1550	TVA-1414
C3	5	200	C-232	PRS250V4	BBR4-250	TC50X	TD-4-250	MT-4504	TVA-1501
C4	5	200	C-232	PRS250V4	BBR4-250	TC50X	TD-4-250	MT-4504	TVA-1501
C5	100	6	C-222	PRS6V100	BBR100-6	TT6X100	TD-100-6	MTH-0610	TVA-1101

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

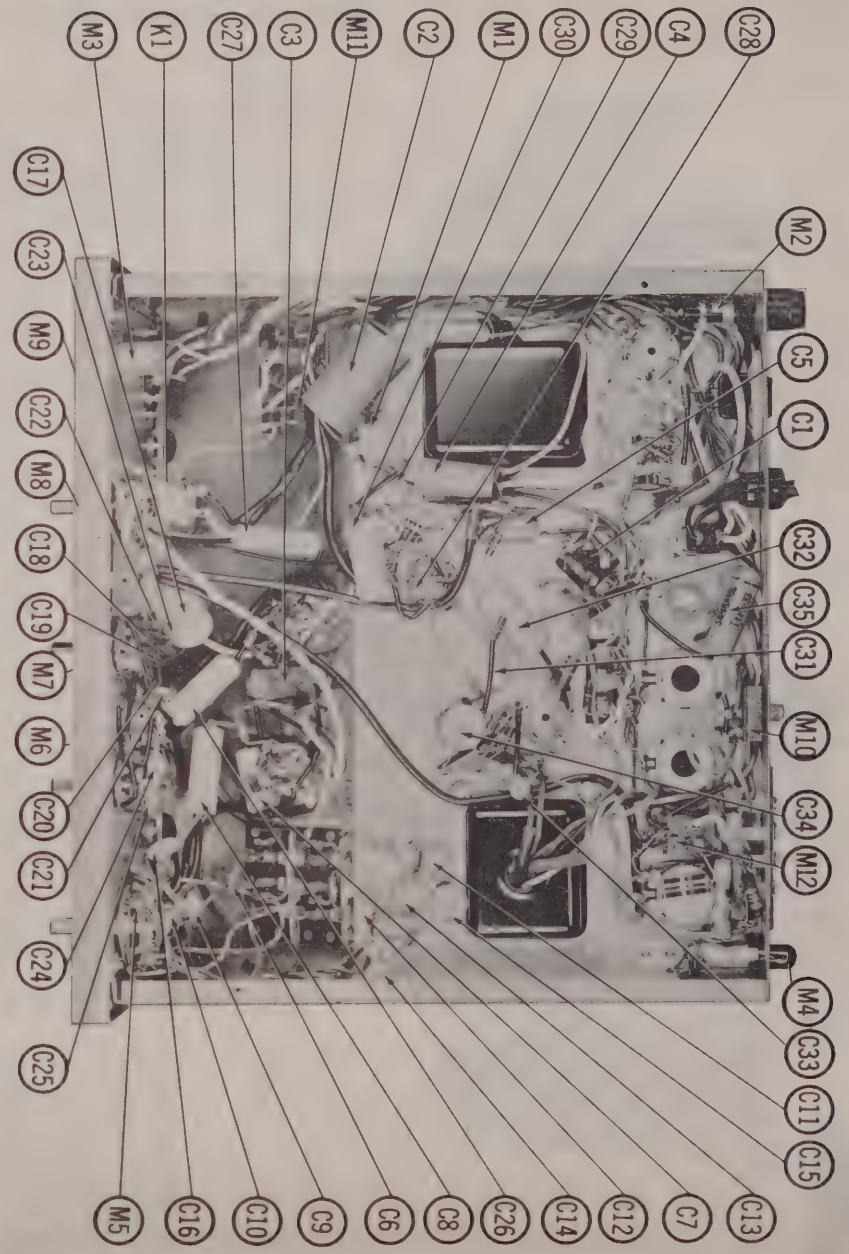
ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C6	27		NPO 10%				C10Q27C	CNO-427		
C7	.022	200			P288N-022	DD-203	CUB4S22	GEM-4122	2TM-S22	
C8	.047	400			P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C9	2200		10%					JL-222		
C10	3300		10%					JL-233		Note 1
C11	620		5%							
C12	390		10%			MD-391				
C13	1800		10%					JL-218		
C14	750		5%							
C15	3300		10%					JL-233		
C16	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C17	.47	200			P288N-47		CUB2P47	GEM-2047	2TM-P47	
C18	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C19	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C20	2200		10%					JL-222		
C21	470		10%			MD-471		JL-347		
C22	8.2		NPO 10%		NPO-DI 8.2		C10V82C			
C23	47		10%		NPO-DI 47	DTZ-47	L10Q47	CNO-447	5TCC-Q47	
C24	4700		10%					JL-247		
C25	4700		10%					JL-247		
C26	.047	400			P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C27	.1	200			P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C28	1.2		10%							Note 1
C29	100		10%		NPO-DI 100	DD-101	L10T1	CNO-310	5TCC-T1	
C30	.22	200			P288N-22		CUB2P22	GEM-2022	2TM-P22	
C31	.1	600			P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C32	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C33	1000		10%					JL-210		
C34	4700		10%					JL-247		
C35	.047	400			P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	

Note 1. Not used in some versions.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	David Bogen PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	50K	½	V428			Q11-123		Volume
B	250K	½				M11-130		Volume, Tap Ⓐ 100K (Note 1)
C	Switch					76-1		
R2A	500K	½	V442	BT-65	A47F5-500K	Q19-133X	UT-431	Treble, Tap Ⓐ 200K
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R3A	1meg	½	V441	B-69	A47-1meg-S	Q11-137	U54	Bass
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	

CHASSIS-BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS (cont)

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	David Bogen PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R4A	25K	½	V410A	AB-26 †	B47-25K-S	B11-120	TA253L	Balance Adj.
B	Shaft			AK-1	Not Req.	TM-1	Not Req.	
R5A	25K	½	V410A	AB-26 †	B47-25K-S	B11-120	TA253L	Bias Adj.
B	Shaft			AK-1	Not Req.	TM-1	Not Req.	
R6A	50Ω	2(WW)	V113A	WN-50	A43-50	W11-050	R50L	Hum Adj.
B	Shaft			Not Req.	FKS-1/4	SK5	Not Req.	
R7A	100Ω	½	V388	WN-101	A43-100	WPK100	U1	Damping Factor
B	Shaft			Not Req.	FKS-1/4	Not Req.	Not Req.	

Note 1. Tap not used.
† Enlarge mounting hole to 3/8" to accommodate bushing type control.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		David Bogen PART No.	NOTES
	OHMS	WATT		
R8	100K			
R9	100K			
R10	2200Ω			
R11	3.3meg			
R12	220K			
R13	10meg			
R14	22K			
R15	75K 5%			
R16	51K 5%			
R17	100K			
R18	100K			
R19	3.3meg			
R20	47K			
R21	15K			
R22	47K			
R23	100K			
R24	470K			
R25	220K			
R26	180K			
R27	100K			
R28	1500Ω			
R29	1meg			
R30	470K			
R31	4700Ω			
R32	68K			
R33	820Ω			
R34	390Ω			
R35	12K			
R36	110K 5%			

ITEM No.	RATING		David Bogen PART No.	NOTES
	OHMS	WATT		
R37	390K			
R38	150K			
R39	220K			
R40	100K			
R41	100Ω			
R42	220K			
R43	100K			
R44	100K			
R45	22meg			
R46	1meg			
R47	100Ω			
R48	1200Ω	1		
R49	1Ω	2		
R50	16Ω 5%			
R51	150Ω	2		
R52	.47Ω	1		Note 1
R53	2.2Ω			Note 1
R54	33K			
R55	110K 5%			
R56	2.2meg 5%			
R57	470K			
R58	3.3meg			
R59	150K			
R60	47K			
R61	10K			
R62	22K			
R63	2.2Ω			
R64	2.2Ω			

Note 1. When R52 is .39Ω 1W, R53 is not used.

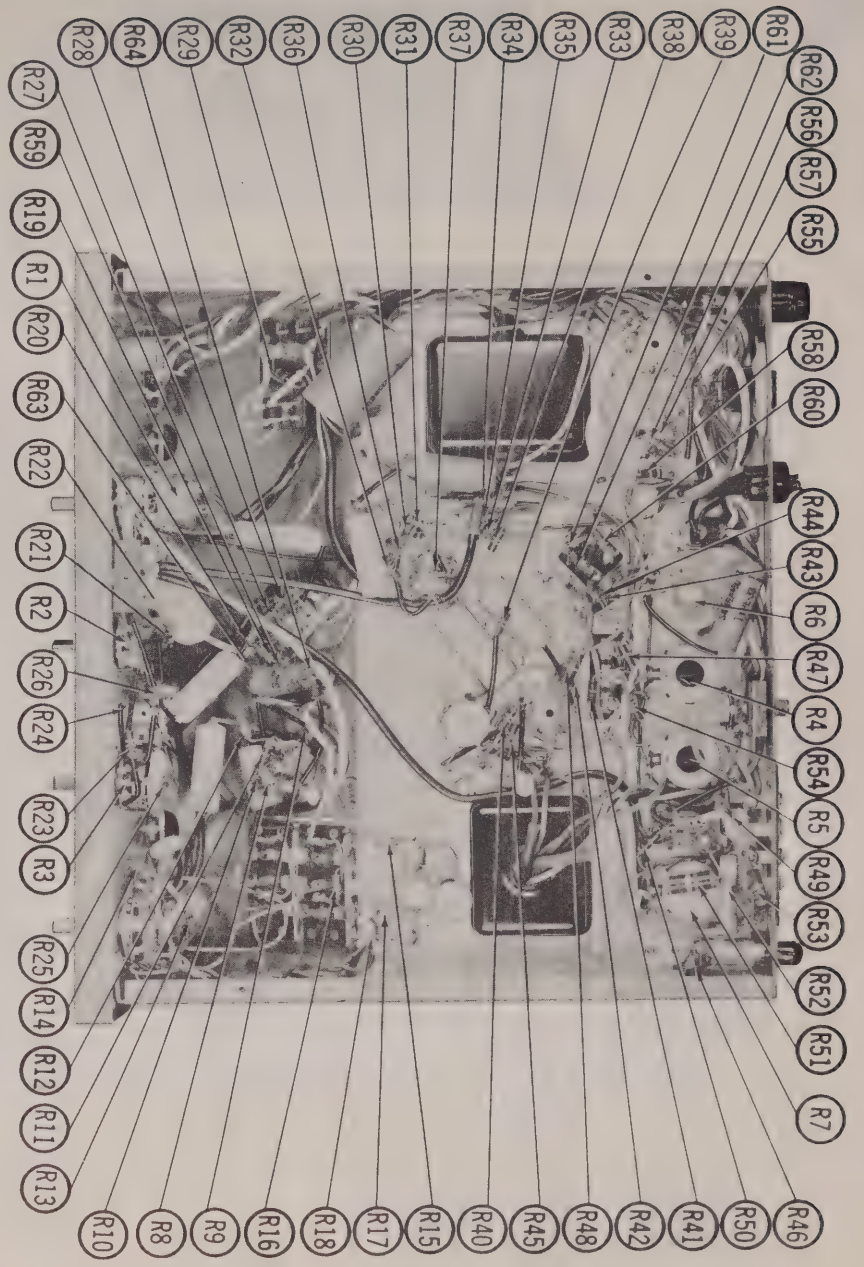
TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	David Bogen PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .52A	680 VCT @ .040A Tap @ 38V @ .0019A	6.3V @ 3.6A	83-508-1						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	David Bogen PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	6300Ω CT	16Ω Taps @ 8Ω, 4Ω	83-202	Z1405 ①			A-3304 ①	22S97 ①	S-35A ①	① Use Original Shields

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	David Bogen PART No.	REPLACEMENT DATA
K1	Tone Compensation	150mmf, 10000mmf, 150Ω, 21K, 47K	C421	Sprague TC-8

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	David Bogen PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.0019A	H373	1159	D-5410	10	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			David Bogen PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG	2A 125V S/B			313002, (2A 125V S/B	342001	MDL2	HKP

MISCELLANEOUS

ITEM No.	PART NAME	David Bogen PART No.	NOTES
M3	Lamp	H639	#12 (Pilot)
M4	Lamp	NE51	#NE51 (Damping Indicator)
M5	Switch	S517	Selector (6 Position, Rotary Wafer Type)
M6	Switch	S514	Low Filter (DPDT, Slide Type)
M7	Switch	S514	High Filter (DPDT, Slide Type)
M8	Switch	S515	Loudness (3 Position, Slide Type)
M9	Switch	S515	Speaker Selector (3 Position, Slide Type)
M10	Switch	S381	Impedance Selector (DPDT, Slide Type)
M11	Switch	S514	Stereo On-Off (DPDT, Slide Type)
M12	Switch	S476	Damping On-Off (DPDT, Slide Type)

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

ADJUSTMENTS

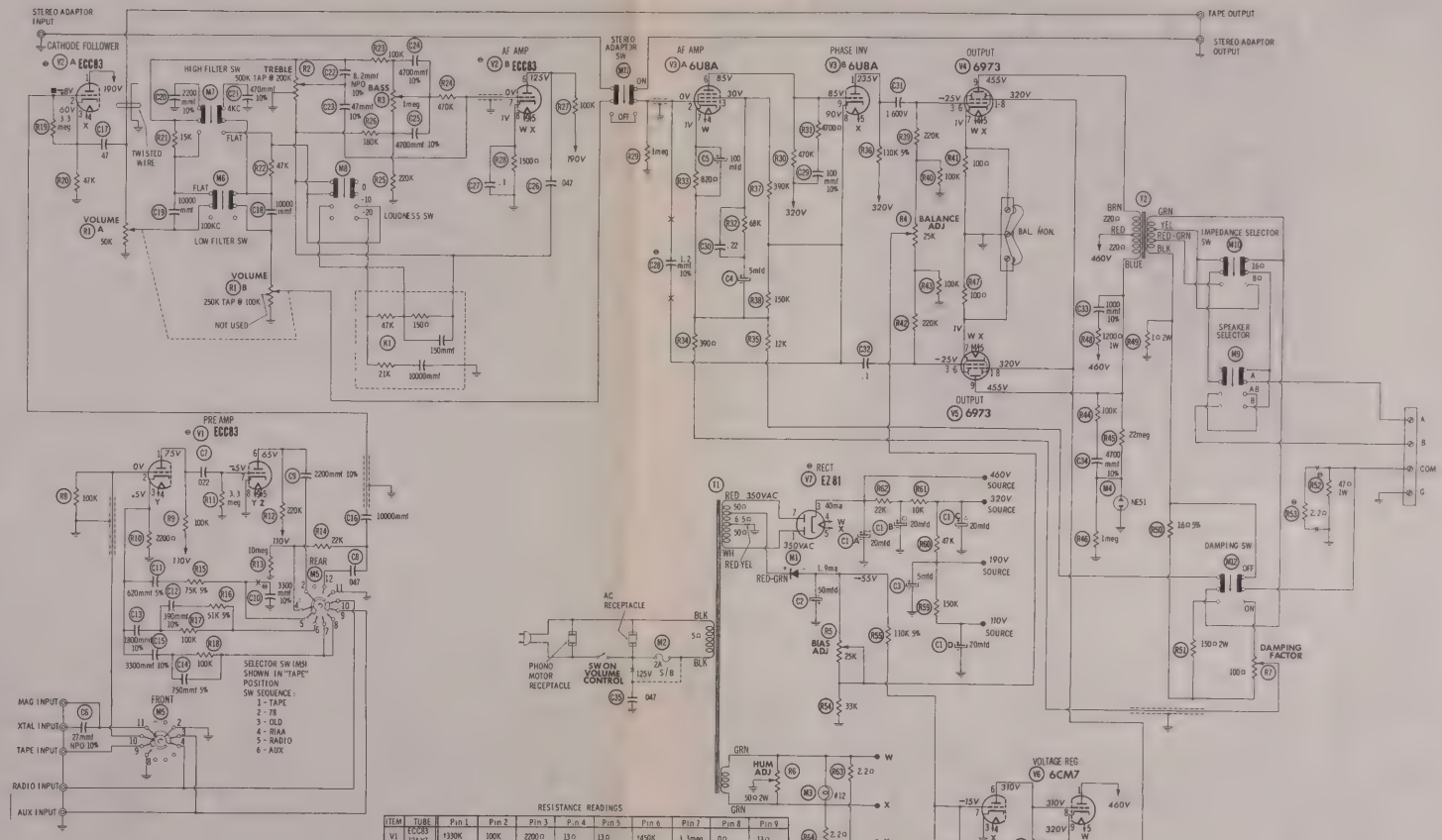
DAMPING FACTOR ADJUSTMENT

1. Turn the Volume and Damping Factor controls fully counterclockwise.
2. Turn the DF switch to the "ON" position.
3. Turn the Damping Factor clockwise slowly until the damping indicator bulb flashes. (CAUTION: Do not allow the speaker to oscillate more than a moment.
4. Slowly rotate the damping control counterclockwise until the damping indicator light stops flashing.

If two speakers are used, make the above adjustment with the speaker selector switch in the AB position so that both speakers will be connected. It is normal for the damping indicator light to flicker while a signal is being fed to the amplifier.

OUTPUT STAGE BALANCING

1. Turn Bias Adj. and Bal. Adj. controls fully clockwise.
2. Remove the two shorting straps from the Bal. Mon. terminal strip on the chassis. Connect the positive lead of an accurate low range DC voltmeter to terminal #1 on the Bal. Mon. strip. Connect negative lead to terminal 2.
3. Adjust the Bias. Adj. for 1.5V on the meter.
4. Transfer the negative lead of the meter from terminal 2 to terminal 3 and adjust the Bal. Adj. for zero volts.
5. Transfer the negative lead of meter from terminal 3 back to terminal 2 and adjust the Bias Adj. again if necessary for 1.5V on meter.
6. Repeat steps 4 and 5 until a voltage of 1.5V is obtained between terminals 1 and 2 and zero volts between 1 and 3. Replace shorting straps on Bal. Mon. Strip.



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	ECC83 12AX7	†330K	100K	2200Ω	13Ω	13Ω	†450K	3.3meg	0Ω	13Ω
V2	ECC83 12AX7	†79K	3.3meg	47K	13Ω	13Ω	†180K	550K	1500Ω	13Ω
V3	6U8A	†140K	1meg	500K	13Ω	13Ω	†500K	1100Ω	130K	†500K
V4	6973	†3.3meg	NC	240K	13Ω	13Ω	240K	100Ω	†3.3meg	†220Ω
V5	6973	†3.3meg	NC	240K	13Ω	13Ω	240K	100Ω	†3.3meg	†220Ω
V6	6CM7	†0Ω	NC	0Ω	13Ω	13Ω	1470K	†1.5meg	1470K	3.3meg
V7	EZ81 6CA4	50Ω	NC	¶	13Ω	13Ω	NC	96.5Ω	NC	TP

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 3 OF V7
* MEASURED FROM PIN 3 OF V2
NC NO CONNECTION
TP TIE POINT

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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DAVID BOGEN MODEL DB125

PHOTOFACT* Folder

FAIRCHILD
MODELS 245, 248

MODEL 248

FAIRCHILD
MODELS 245, 248

TRADE NAME	Fairchild Models 245, 248
MANUFACTURER	Fairchild Recording Equipment Co., 10-40 45th Ave., Long Island City 1, N. Y.
TYPE SET	AC Operated Preamplifier (Model 248 Is Stereo) (Model 248 Consists of Two Model 245 Units and a Switching Circuit)
TUBES	Model 245: 4 Model 248: 8
POWER SUPPLY	110-120 Volts AC, 60 Cycles RATING 26 Watts, .210 Amp. @ 117 Volts AC

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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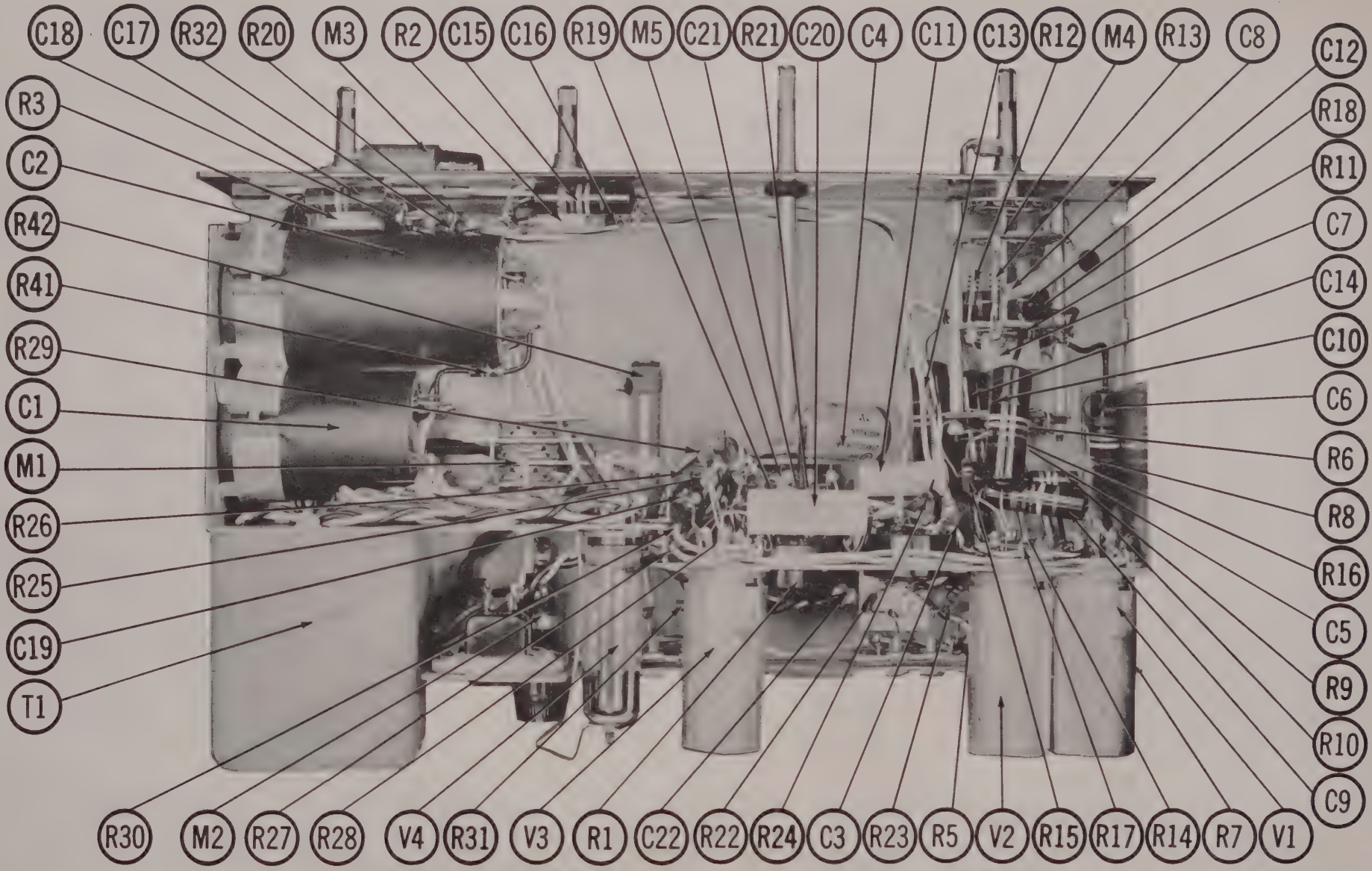
H922

SET 437 FOLDER 6



CHASSIS BOTTOM VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	1st Preamplifier	EF86/6267
V2	2nd Preamplifier	EF86/6267

ITEM No.	USE	TYPE
V3	AF Amplifier	ECC83/12AX7
V4	Rectifier	6X4

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	FAIRCHILD PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	▲10	350						TVLS-2606 *	
B	▲500	50			XB0264			TVLS-3573.5*	
C2A	▲80	300			BR10001				
B	■40	300							
C	▲1000	25							
C3	50	6		SRE6V50	BBR50-6	TT6X50	TD-50-6	TVA-1100	
C4	4	50		PRS150V4	BBR4-50	TT50X4	TD-4-50	TVA-1402	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING			REPLACEMENT DATA						NOTES
	CAP.	VOLT	TOL	FAIRCHILD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	.056	200	10%					GEM-6156	2WF-S56	
C6	.027	200	10%						2WF-S27	
C7	840		5%							
C8	270		5%		1469-00027	MD-271	5R5T27		MS-327	
C9	.027	200	10%						2WF-S27	
C10	.12	200	10%						2WF-P12	
C11	.25	200			P288N-25		CUB2P25	GEM-2025	2TM-P25	
C12	.033	200	10%						2WF-S33	
C13	.12	200							2WF-P12	
C14	.12	200							2WF-P12	
C15	.0027	200	10%						5BF-D27	
C16	.027	200	10%						2WF-S27	
C17	.001	200	10%					GEM-1621	5BF-D10	
C18	.0082	200	10%					GEM-16282	5BF-D82	
C19	.027	200	10%						2WF-S27	
C20	.22	400			P488N-22		CUB4P22	GEM-4022	4TM-P22	
C21	50				DI 50	DD-500	L10Q5		5GA-Q5	
C22	.0068	600	10%					GEM-16268	5BF-D68	
C23	390				DI 390	DD-391	L10T39	B-339	5GA-T39	
C24	.047	400			P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C25	390				DI 390	DD-391	L10T39	B-339	5GA-T39	
C26	.047	400			P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C27	.0068	600			P688N-0068	D6-682	CUB6D68	GEM-6268	6TM-D68	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	FAIRCHILD PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	180K	½						Volume, Tap @ 90K
B	180K	½						Volume, Tap @ 90K
C	Switch							
R2	500K	½	B86101					Bass
R3	500K	½	B86100					Treble
R4A	180K	½	B86102					Master Volume, Left Channel Tap @ 90K
B	180K	½						Master Volume, Right Channel Tap @ 90K
C	Switch							

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		FAIRCHILD PART No.	NOTES
	OHMS	WATT		
R5	1meg			
R6	47K			
R7	47K			
R8	33K			
R9	270K 5%			
R10	4000Ω	3		
R11	10meg			
R12	68K 5%			
R13	330K 5%			
R14	1meg			
R15	100K			
R16	270K			
R17	1000Ω			
R18	10meg			
R19	12K			
R20	100K			
R21	10K			
R22	33K			
R23	33K			

ITEM No.	RATING		FAIRCHILD PART No.	NOTES
	OHMS	WATT		
R24	1meg			
R25	270K	1		
R26	10K			
R27	2200Ω	1		
R28	1meg			
R29	47K			
R30	1000Ω			
R31	220K			
R32	10K			
R33	22K			
R34	47K			
R35	47K			
R36	10K			
R37	22K			
R38	47K			
R39	47K			
R40	10K			
R41	10K			
R42	50Ω	10		

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	FAIRCHILD PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .210A	500VCT @ .005A	24V @ .335A Tap @ 6V @ .75A							
	SEC. 3	SEC. 4								

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	FAIRCHILD PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.335A		1017	C1B	604B	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			FAIRCHILD PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG	1A 250V			312001. (3AG 1A 250V)	342001	AGC1	HKP

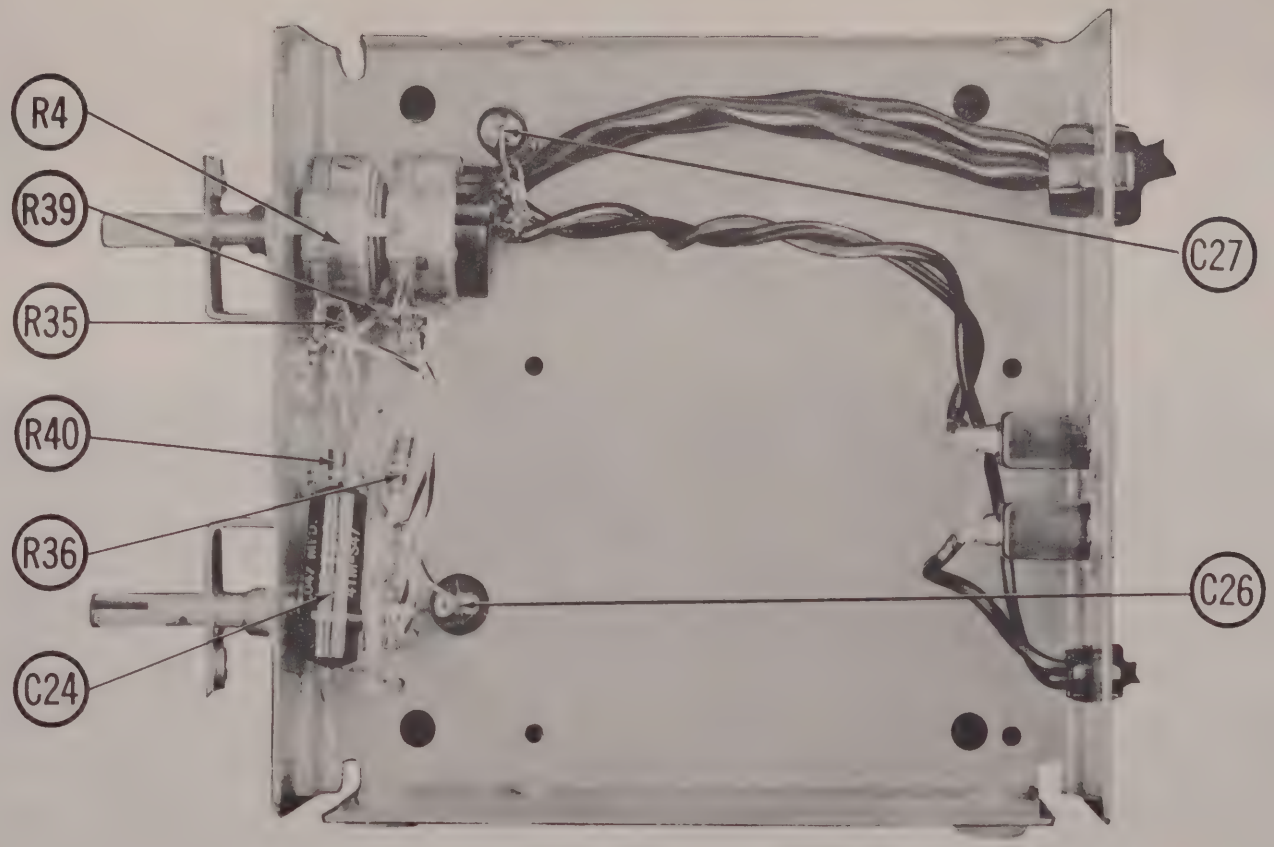
MISCELLANEOUS

ITEM No.	PART NAME	FAIRCHILD PART No.	NOTES
M3	Lamp		#47
M4	Switch		Function (8 Position, Rotary, Wafer Type)
M5	Switch		Function (4 Position, Rotary, Wafer Type)

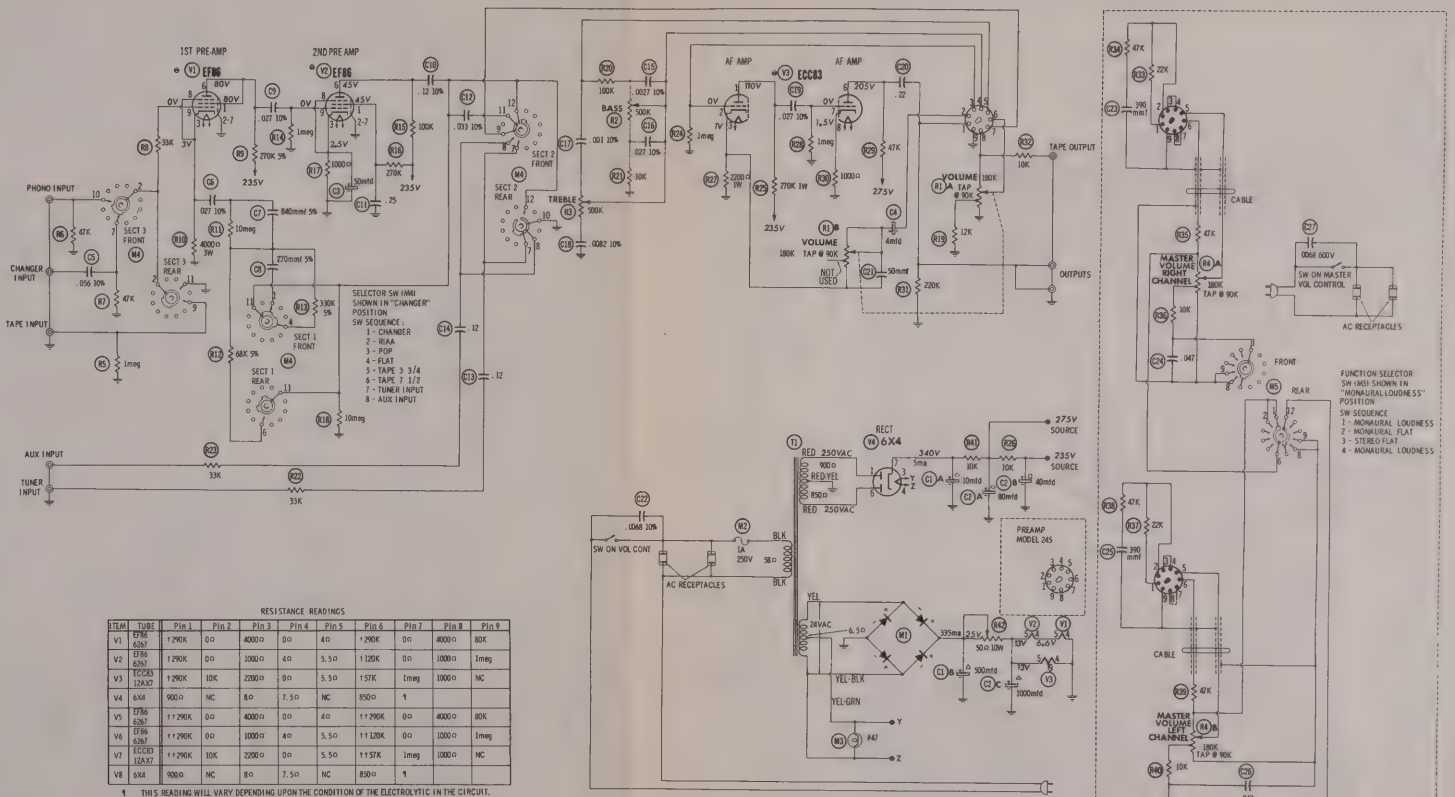
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)



SWITCHING CIRCUIT CHASSIS



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	EF86 6267	†290K	0Ω	4000Ω	0Ω	4Ω	†290K	0Ω	4000Ω	80K
V2	EF86 6267	†290K	0Ω	1000Ω	4Ω	5.5Ω	†120K	0Ω	1000Ω	1meg
V3	ECC83 12AX7	†290K	10K	2200Ω	0Ω	5.5Ω	†57K	1meg	1000Ω	NC
V4	6X4	900Ω	NC	8Ω	7.5Ω	NC	850Ω	¶		
V5	EF86 6267	††290K	0Ω	4000Ω	0Ω	4Ω	††290K	0Ω	4000Ω	80K
V6	EF86 6267	††290K	0Ω	1000Ω	4Ω	5.5Ω	††120K	0Ω	1000Ω	1meg
V7	ECC83 12AX7	††290K	10K	2200Ω	0Ω	5.5Ω	††57K	1meg	1000Ω	NC
V8	6X4	900Ω	NC	8Ω	7.5Ω	NC	850Ω	¶		

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 7 OF V4.
†† MEASURED FROM PIN 7 OF V8.
NC NO CONNECTION

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

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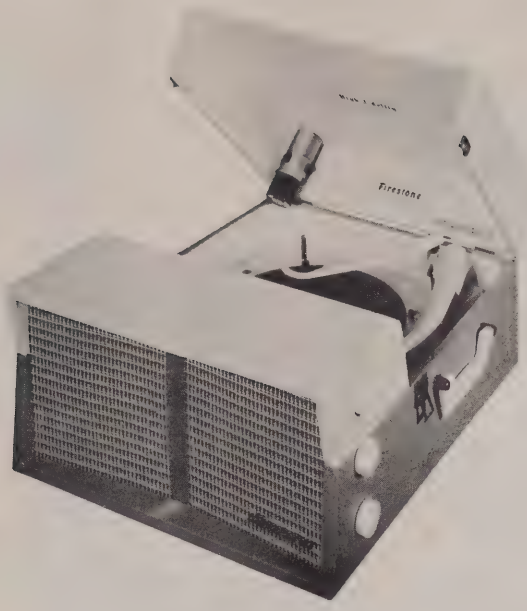
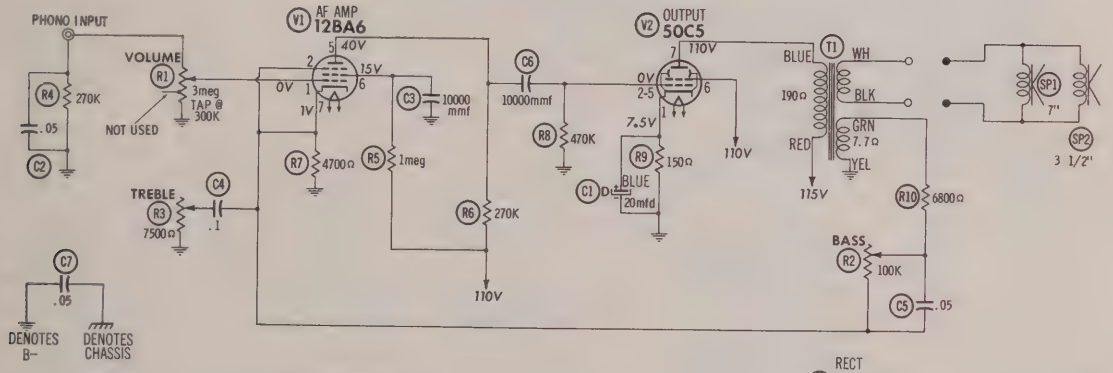
EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

FIRESTONE MODEL 4-A-185 (Code 364-8-270)

FIRESTONE MODEL
4-A-185 (Code 364-8-270)

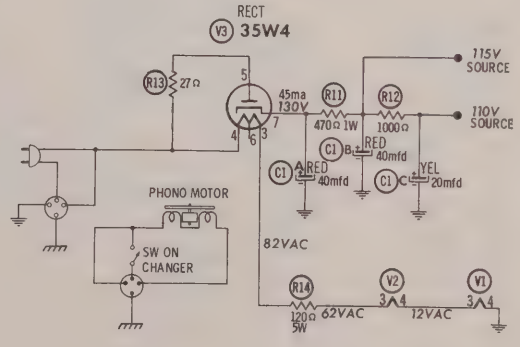


TRADE NAME	Firestone Model 4-A-185 (Code 364-8-270)
SUPPLIER	Firestone Tire & Rubber Co., 1200 Firestone Parkway, Akron, Ohio
TYPE SET	AC Operated 3 Tube Phono Amplifier With 4 Speed Automatic Record Changer
POWER SUPPLY	110-120 Volts AC, 60 Cycles RATING 26 Watts, .28 Amp. @ 117 Volts AC (Less Motor)



Pin	V1	V2	V3
No.	12BA6	50C5	35W4
1	0Ω	150Ω	NC
2	2400Ω	470K	NC
3	12Ω	62Ω	182Ω
4	0Ω	12Ω	215Ω
5	†270K	470K	245Ω
6	†1meg	†1500Ω	195Ω
7	2400Ω	†660Ω	20K(Min.

† MEASURED FROM PIN 7 OF V3.



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FIRESTONE MODEL
4-A-185 (Code 364-8-270)

SET 437 FOLDER 7

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	12BA6	
V2	Output	50C5	
V3	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	FIRESTONE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	
C1A	40	150	1019			WQ230		TVAS-4520 *	
B	40	150							
C	20	150							
D	20	25							

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		TOL	REPLACEMENT DATA						NOTES
	CAP.	VOLT		FIRESTONE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	.05	400			P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C3	10000				BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C4	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C5	.05	400			P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C6	10000				BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C7	.05	400			P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	FIRESTONE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	3meg	½	401E	BT-79	A47F3-3meg	Q13-140	U67	Volume, Tap ② 300K ①
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R2A	100K	½	416	B-43	A47-100K-S	Q11-128	U41	Bass
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R3A	7500Ω	½	408G	B-15	A47-10K-Z	Q13-116	U18	Treble
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	

① Tap not used.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

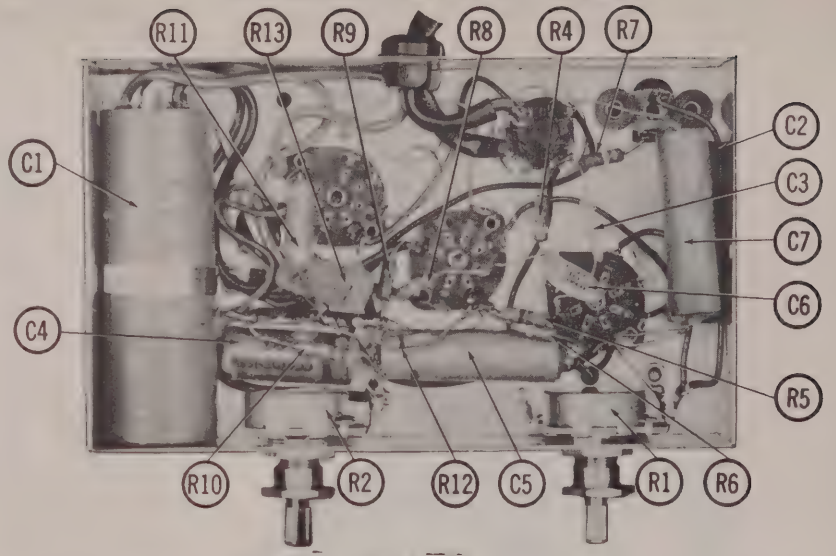
ITEM No.	RATING		FIRESTONE PART No.	NOTES
	OHMS	WATT		
R4	270K			
R5	1meg			
R6	270K			
R7	4700Ω			
R8	470K			
R9	150Ω			

ITEM No.	RATING		FIRESTONE PART No.	NOTES
	OHMS	WATT		
R10	6800Ω			
R11	470Ω	1		
R12	1000Ω			
R13	27Ω		542	Fuse Type
R14	120Ω	5	625	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2400Ω	100Ω	1209C							
		SEC.2								
		3-4Ω								
	Turns Ratio									
	PRI.	SEC.1								
	5	: 1								

CHASSIS-BOTTOM VIEW



SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	FIRESTONE PART No.	QUAM PART No.	
SP1	7"	PM	3-4Ω	2629 ①	7A21 ①	① Parallel and Phase
SP2	3½"	PM	14-16Ω	2633 ①	3A15TZ16①	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	FIRESTONE PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1	2589	93-T				

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	FIRESTONE PART No.	JENSEN PART No.	WALCO PART No.	
M2			* W-201DS	* Includes Cartridge

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

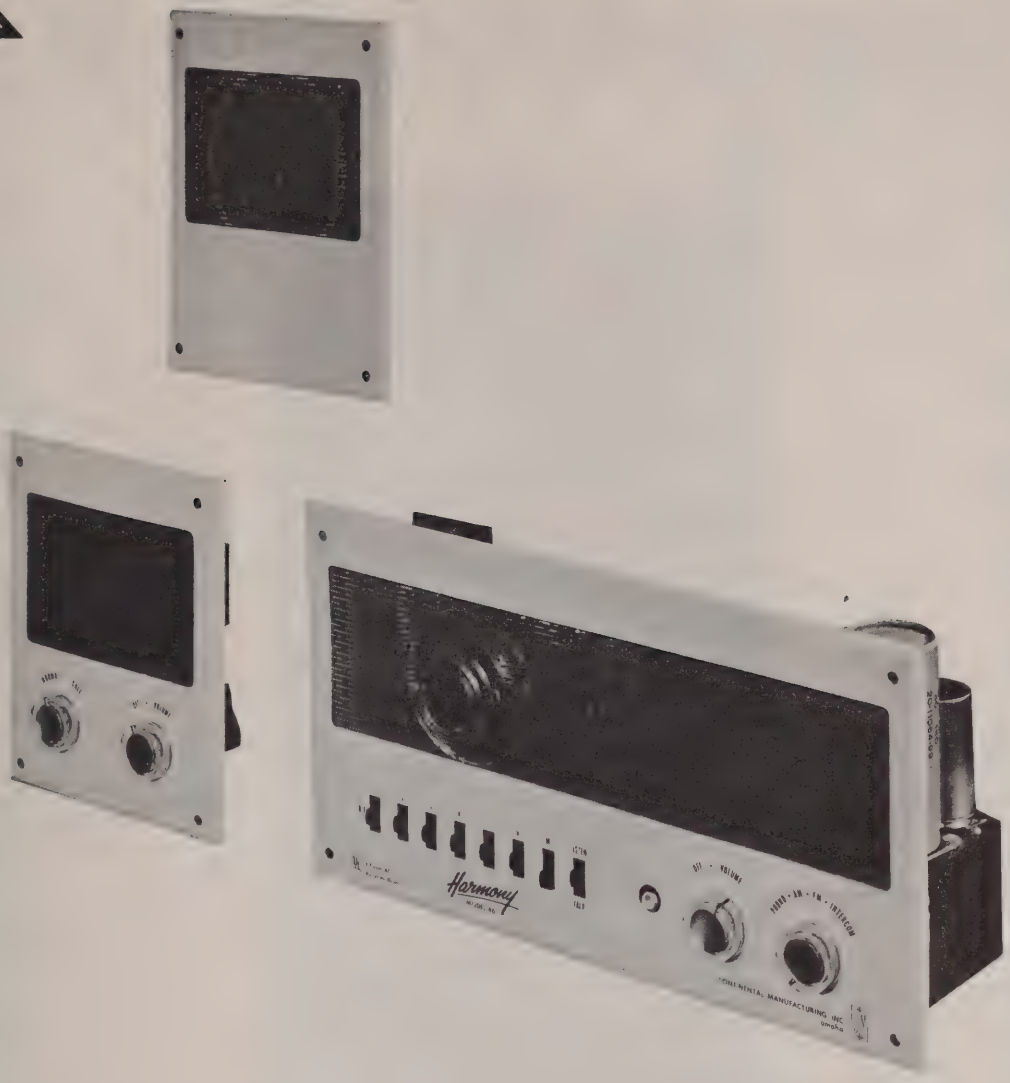
NAME	PART NO.	DESCRIPTION
Knob	2430C	Volume
Knob	2454	Treble
Knob	2455	Bass

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

PHOTOFACT* Folder

HARMONY
MODEL 46



HARMONY
MODEL 46

TRADE NAME	Harmony Model 46		
MANUFACTURER	Continental Manufacturing, Inc., 1612 California Street, Omaha, Nebraska		
TYPE SET	AC-DC Operated FM-AM Receiver and Intercommunications Unit		
TUBES	Eight		
POWER SUPPLY	110-120 Volts AC-DC	RATING	23 Watts, .26 Amp. @ 117 Volts AC
TUNING RANGES	BROADCAST 550-1700KC	FREQ. MOD.	88-108MC

RADIO-PHONO-INTERCOM VOLUME ADJUSTMENT

1. Set function switch to "Intercom" position and turn on receiver.
2. Adjust volume control for desired listening level from remote stations.
3. Turn function switch to either "FM" or "AM" position.
4. Insert screwdriver in chassis hole between and below volume control and function switch, and adjust control so that disturbances will be heard over the radio sound when the remote stations are monitored.

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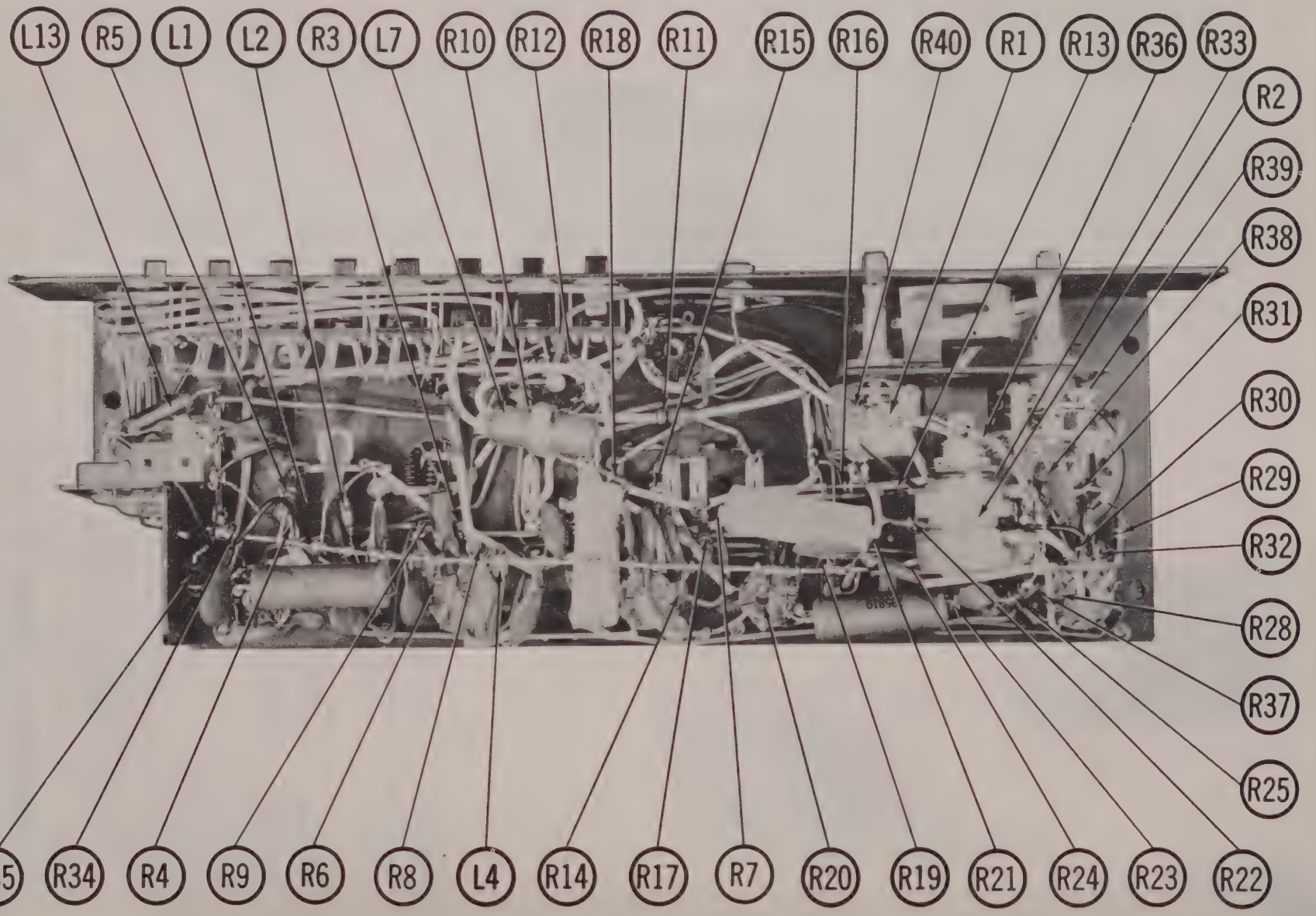
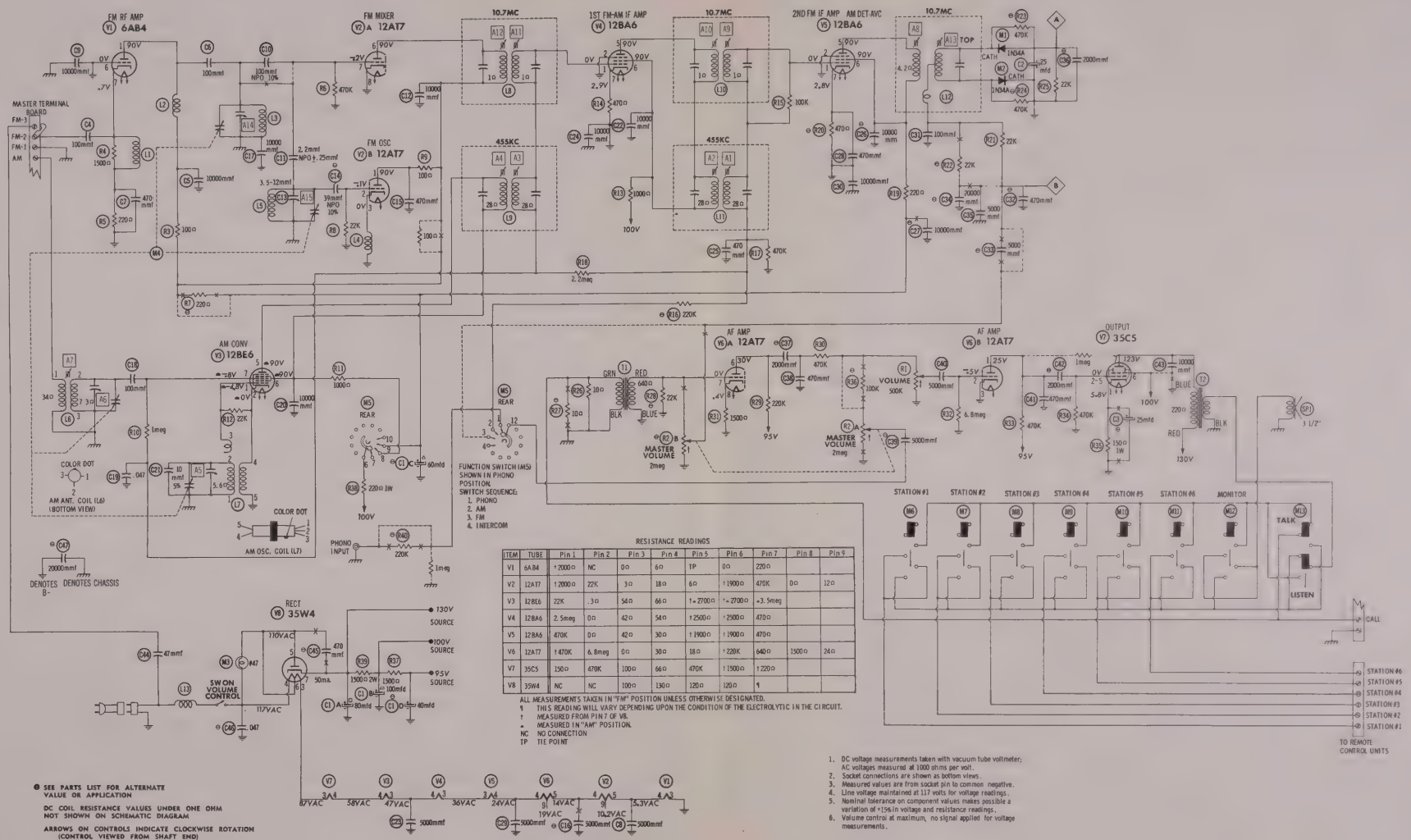
H911

SET 437 FOLDER 8



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AB4	†2000Ω	NC	0Ω	6Ω	TP	0Ω	220Ω		
V2	12AT7	†2000Ω	22K	3Ω	18Ω	6Ω	†1900Ω	470K	0Ω	12Ω
V3	12BE6	22K	.3Ω	54Ω	66Ω	†=2700Ω	†=2700Ω	=3.5meg		
V4	12BA6	2.5meg	0Ω	42Ω	54Ω	†2500Ω	†2500Ω	470Ω		
V5	12BA6	470K	0Ω	42Ω	30Ω	†1900Ω	†1900Ω	470Ω		
V6	12AT7	†470K	6.8meg	0Ω	30Ω	18Ω	†220K	640Ω	1500Ω	24Ω
V7	35C5	150Ω	470K	100Ω	66Ω	470K	†1500Ω	†220Ω		
V8	35W4	NC	NC	100Ω	130Ω	120Ω	120Ω	¶		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
† MEASURED FROM PIN 7 OF V8.
= MEASURED IN "AM" POSITION.
NC NO CONNECTION
TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±5% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

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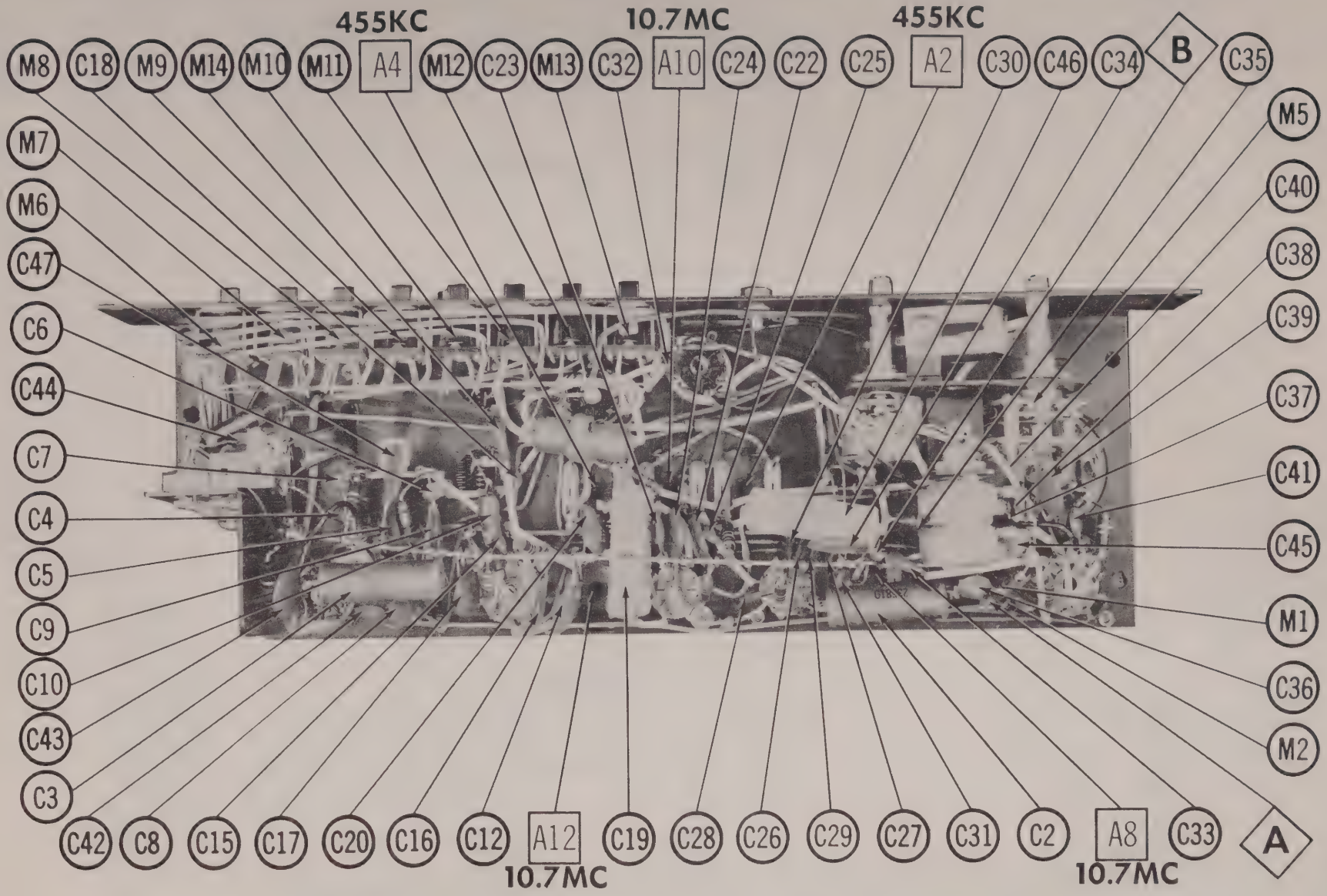
HARMONY
MODEL 46



CHASSIS BOTTOM VIEW - CAPACITOR, MISC, & ALIGNMENT IDENT

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1mfd capacitor in series with low side of signal generator and B-.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.
Suggested Alignment Tools: A1 thru A4, A7 thru A13..... GENERAL CEMENT #8606, 8606L, 8282, 9295
WALSCO #2545
A5, A6, A14, A15..... GENERAL CEMENT #5000, 5003, 5004, 5008, 5009, 8276, 8290
WALSCO #2515, 2520, 2523, 2525, 2537

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to AM antenna stator lug of tuning cap. Low side to B-.	455KC (400% Mod.)	AM	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	200mmf	High side to AM antenna terminal lug. Low side to B-.	1600KC	"	1600KC	"	A5, A6	"
3.	"	"	600KC	"	Tune to 600KC signal	"	A7	Adjust for maximum output. Repeat steps 2 and 3.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	.01mfd	High side to pin 7 (grid) of 12AT7 (V2). Low side to B-.	10.7MC (Unmod.)	FM	Point of non-interference	DC probe to point (A). Common to B-.	A8, A9, A10, A11, A12	Adjust for maximum deflection.
5.	"	"	"	"	"	DC probe to point (B). Common to B-.	A13	Adjust for zero reading. A positive a and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4.	.01mfd	High side to pin 7 (grid) of 12AT7 (V2). Low side to B-.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point (A). Low side to B-.	A8, A9, A10, A11, A12	Disconnect stabilizing capacitor C2. Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
5.	"	"	"	"	"	Vert. Amp. to point (B). Low side to B-.	A13	Reconnect stabilizing capacitor C2. Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A8 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
6.	270Ω Carbon Resistor	High side to FM antenna terminal. Low side to B-.	108MC (Unmod.)	FM	108MC	DC probe to point (A). Common to B-.	A14	Adjust for maximum output.
7.	"	"	106MC	"	Tune to 106MC signal	"	A15	"

FIG. 1

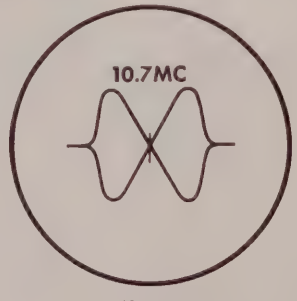


FIG. 2

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	6AB4	
V2	FM Mixer - FM Osc.	12AT7	
V3	AM Converter	12BE6	
V4	1st FM - AM IF Amplifier	12BA6	
V5	2nd FM IF Amplifier - AM Det. - AVC	12BA6	
V6	AF Amplifier	12AT7	
V7	Output	35C5	
V8	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA HARMONY PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	■80	150		AFH4-01-40	D0014	FP412	TMQ-115	TVL-4445	
B	▲100	150							
C	▲60	150	①						
D	40	150	①						
C2	25	25		PRS25V25	BBR25-25	TT25X20	TD-25-25	TVA-1205	
C3	25	25	②	PRS25V25	BBR25-25	TT25X20	TD-25-25	TVA-1205	

① In some versions C1C and C1D may be reversed. ② Not used in some versions.

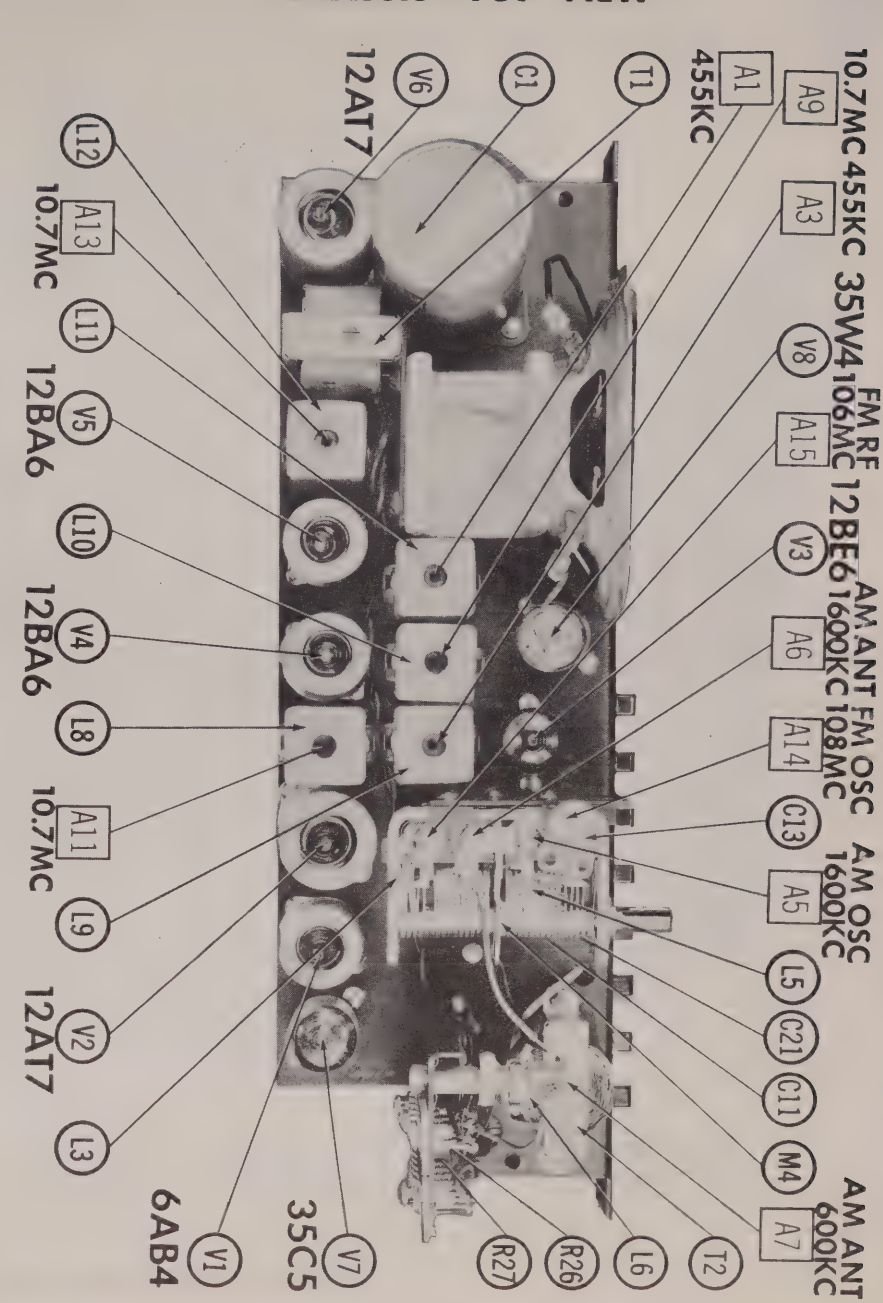
FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA HARMONY PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	100				BPD-0001	DD-101	L10T1	CNO-310	5GA-T1	
C5	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C6	100				BPD-0001	DD-101	L10T1	CNO-310	5GA-T1	
C7	470				BPD-00047	DD-471	L10T47	B-347	5GA-T47	
C8	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-S5	
C9	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C10	100		NPO 10%		NPO-SI 100	TCZ-100	CTA6T1C	ZT-531	5TCC-T1	
C11	2.2		NPO ±.25mmf					CNO-522		
C12	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C13	3.5-12									
C14	39		NPO 10%		NPO-DI 39		C10Q39C	CNO-439	5TCC-Q39	①
C15	470				BPD-00047	DD-471	L10T47	B-347	5GA-T47	
C16	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	②
C17	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C18	100				BPD-0001	DD-101	L10T1	CNO-310	5GA-T1	
C19	.047	400			P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C20	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C21	10		5%		1469-00001	DTZ-10	22R5Q1	MCE-220	MS-41	
C22	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C23	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C24	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C25	470				BPD-00047	DD-471	L10T47	CNO-470	5HK-T47	
C26	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	③②
C27	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C28	470				BPD-00047	DD-471	L10T47	B-347	5GA-T47	
C29	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C30	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C31	100				BPD-0001	DD-101	L10T1	B-310	5GA-T1	
C32	470				BPD-00047	DD-471	L10T47	B-347	5GA-T47	④
C33	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	④②
C34	20000				BPD-02	DD-203	BYB6S2	B-120	5HK-S2	④②
C35	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C36	2000				BPD-002	DD-202	BYA10D2	B-220	5HK-D2	④
C37	2000				BPD-002	DD-202	BYA10D2	B-220	5HK-D2	④
C38	470				BPD-00047	DD-471	L10T47	B-347	5GA-T47	
C39	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	⑤
C40	5000				BPD-005	DD-502	BYA10D5	B-250	5HK-D5	
C41	470				BPD-00047	DD-471	L10T47	B-347	5GA-T47	
C42	2000				BPD-002	DD-202	BYA10D2	B-220	5HK-D2	③
C43	10000				BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C44	47				BPD-000047	DD-470	L10Q47	CNO-447	5GA-Q47	
C45	470				BPD-00047	DD-471	L10T47	B-347	5GA-T47	⑥②
C46	.047	400			P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	⑥②
C47	20000				BPD-02	DD-203	BYB6S2	B-120	5HK-S2	⑥②

① Some versions may use 20mmf in this application.
② Not used in some versions.
③ Some versions may use 5000mmf in this application.
④ Some versions may use 1500mmf in this application.
⑤ Some versions may use 10000mmf in this application.
⑥ Some versions may use .05mfd in this application.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	HARMONY PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	½		B-60	A47-500K-Z	Q13-133	U48	Volume
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
C	Switch			KB-1 or KR-1*	SWE-12	76-1	US-26	
R2A	2meg	½	BA817-112	BB-110	AD47-2meg-S	Q11-139	UE1874	Master Volume
B	2meg	½	①	Not Req.	Not Req.	M11-139	Not Req.	Master Volume ①
C	Shaft			Not Req.	FKS-1/4	Not Req.	Not Req.	

* Use KR with CRL "Red Label" Controls and KB with "Blue Label" Controls.
① R2B is not used in some versions.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		HARMONY PART No.	NOTES
	OHMS	WATT		
R3	100Ω			
R4	1500Ω			
R5	220Ω			
R6	470K			
R7	220Ω			Notes 1, 4
R8	22K			
R9	100Ω			
R10	1meg			
R11	1000Ω			
R12	22K			
R13	1000Ω			
R14	470Ω			
R15	100K			
R16	220K			Note 2
R17	470K			
R18	2.2meg			
R19	220Ω			
R20	470Ω			Note 3
R21	22K			

ITEM No.	RATING		HARMONY PART No.	NOTES
	OHMS	WATT		
R22	22K			Note 4
R23	470K			Note 5
R24	470K			Note 5
R25	22K			
R26	10Ω			
R27	10Ω			Note 4
R28	22K			Note 6
R29	220K			
R30	470K			
R31	1500Ω			
R32	6.8meg			
R33	470K			
R34	470K			
R35	150Ω	1		
R36	100K			Note 4
R37	1500Ω			
R38	220Ω	1		
R39	1500Ω	2		
R40	220K			Note 4

Note 1. Some versions may use 100Ω in this application.
Note 2. Some versions may use 120K in this application.
Note 3. Some versions amy use 220Ω in this application.
Note 4. Not used in some versions.
Note 5. Some versions may use 220K in this application.
Note 6. Some versions may use 470K in this application.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		HARMONY PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	FM Ant. Coil						
L2	RF Choke						3.3 Microhenries
L3	FM RF Coil						
L4	Cathode Choke						3.3 Microhenries
L5	FM Osc. Coil						
L6	AM Ant. Coil						
L7	AM Osc. Coil		14-1073				
L8	1st FM IF Trans.		16-3487	FM-254	1463		
L9	1st AM IF Trans.		16-6758	BC-352	12-C1	RF-1	
L10	2nd FM IF Trans.		16-3487	FM-254	1463		
L11	2nd AM IF Trans.		16-6758	BC-353	12-C2	RF-2	
L12	Ratio Detector		17-3498	FM-255	1465		
L13	Line Choke						3.2 Microhenries

TRANSFORMER (INPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	HARMONY PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	3-4Ω	18.5K						A-6X	
	Turns Ratio								
	1	: 70							

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	HARMONY PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	2800Ω	3-4Ω		Z1101	A-3025	AU-605	A-3332	24S53	S-12X	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	HARMONY PART No.	QUAM PART No.	
SP1	3½"	PM	3-4Ω	1100	3A07	Master Station
SP2	3½"	PM	3-4Ω	5018	3A07	Inside Remote
SP3	3½"	PM	3-4Ω	1102	3A070T	Outside Remote

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		HARMONY PART No.	CBS PART No.	SYLVANIA PART No.	
M1	1N34A		1N34A	1N38A	Ratio Detector (Pigtail)
M2	1N34A		1N34A	1N38A	Ratio Detector (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	HARMONY PART No.	NOTES
M3	Lamp		#47
M4	Tuning Cap.		FM-AM, 4 Gang
M5	Switch		Function (4 Position, Rotary, Wafer Type)
M6	Switch		Station No. 1 (DPDT, Slide Type)
M7	Switchq		Station No. 2 (DPDT, Slide Type)
M8	Switch		Station No. 3 (DPDT, Slide Type)
M9	Switch		Station No. 4 (DPDT, Slide Type)
M10	Switch		Station No. 5 (DPDT, Slide Type)
M11	Switch		Station No. 6 (DPDT, Slide Type)
M12	Switch		Monitor (DPDT, Slide Type)
M13	Switch		Listen-Talk (DPDT, Slide Type)

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

PHOTOFACT* Folder

EIA ELECTRONIC INDUSTRIES ASSOCIATION MEMBER

OLYMPIC
MODELS 682, 683

OLYMPIC
MODELS 682, 683

MODEL 683

OLYMPIC
MODELS 682, 683

TRADE NAME	Olympic Models 682, 683		
MANUFACTURER	Olympic Radio & Tel. Corp., 34-01 38th Ave., Long Island City 1, N. Y.		
TYPE SET	AC Operated FM-AM Receiver With 4 Speed Automatic Record Changer		
TUBES	Twelve		
POWER SUPPLY	110-120 Volts AC, 60 Cycles	RATING	92 Watts, .91 Amp. @ 117 Volts AC (Less Motor)
TUNING RANGE	BROADCAST 535-1700KC	FREQ. MOD.	88-108MC

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE V-M 959 - PHOTOFACT SET 396 FOLDER 13

SET 437 FOLDER 9

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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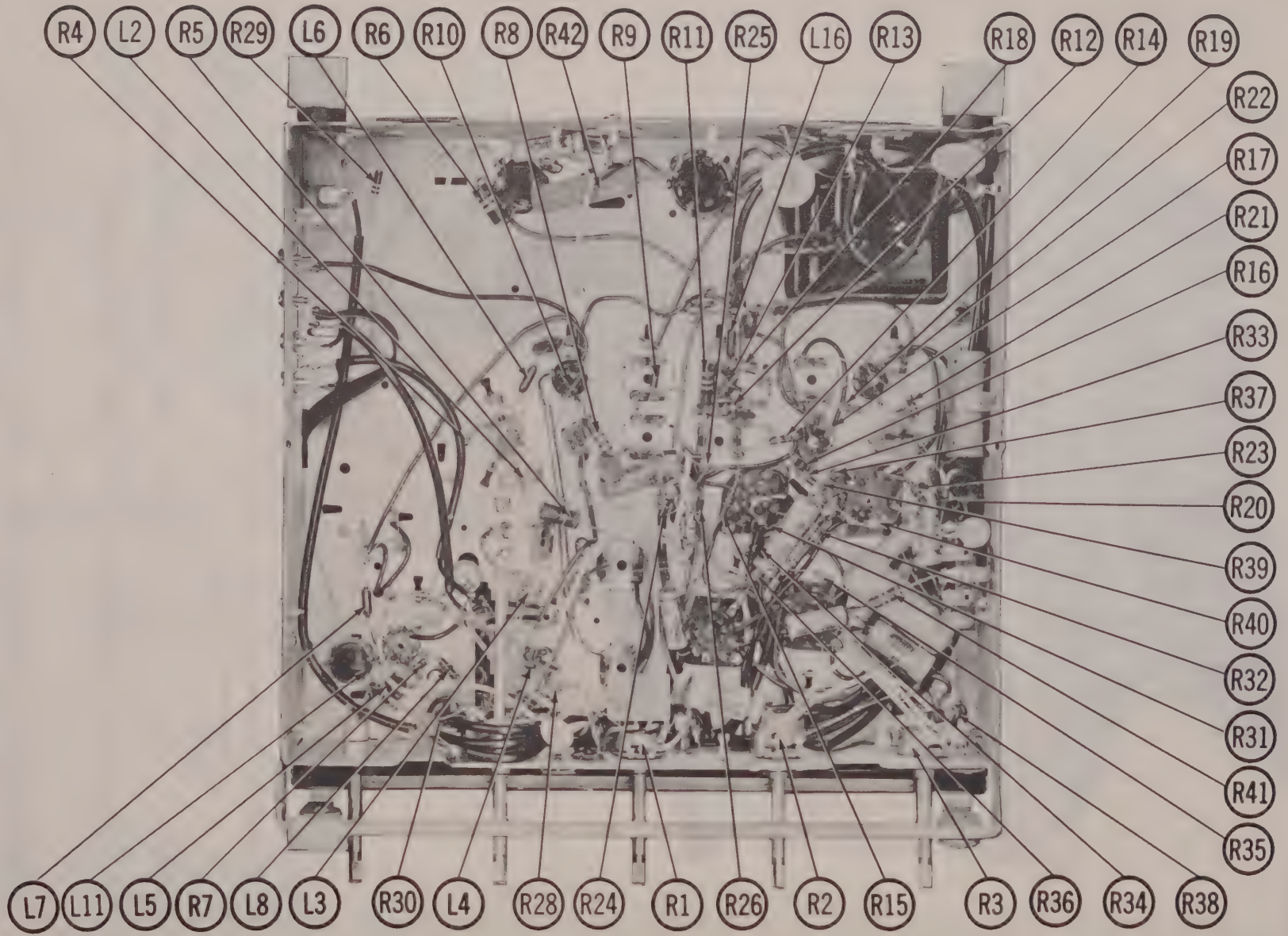
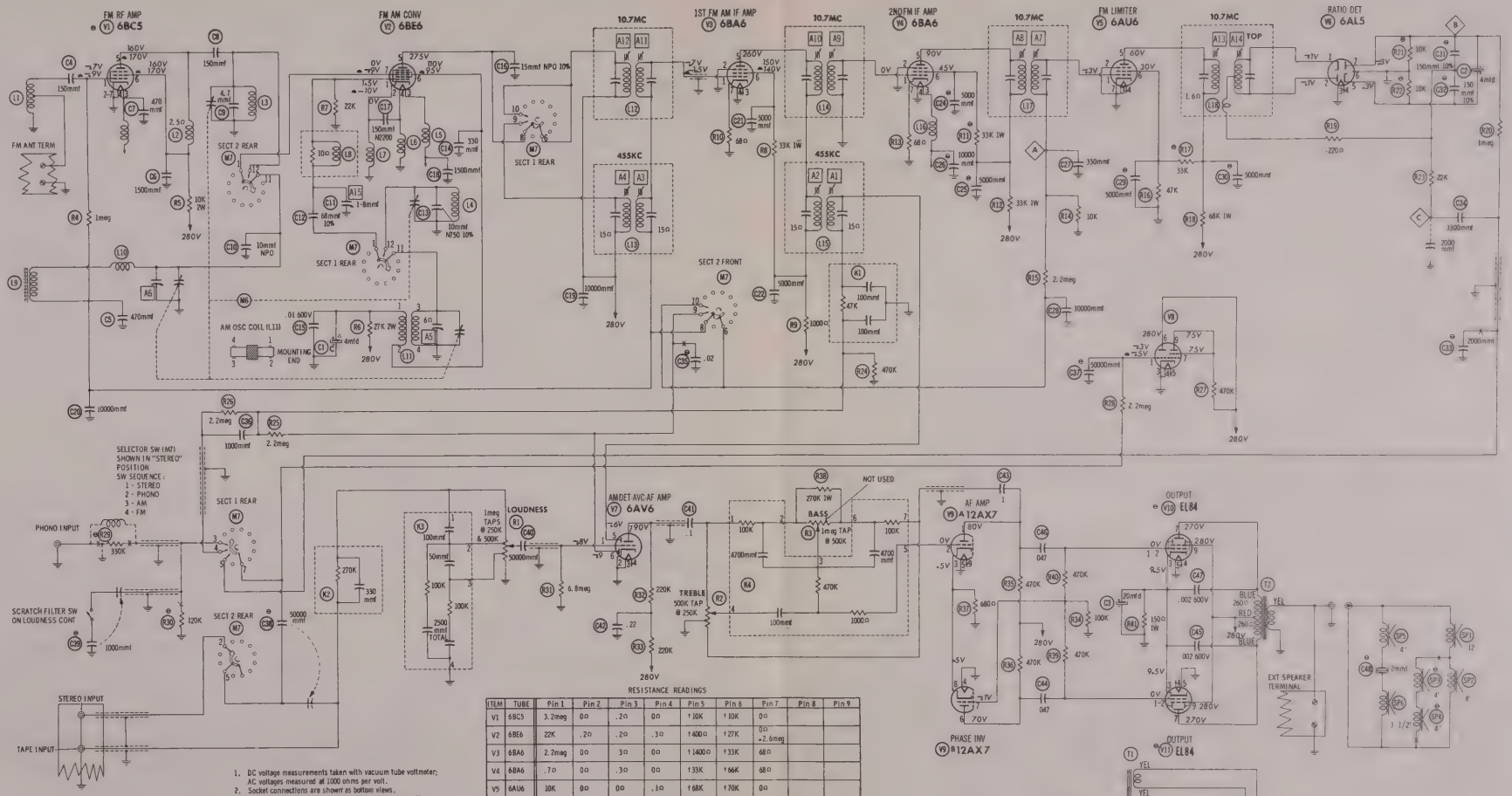
H912



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BC5	3.2meg	0Ω	.2Ω	0Ω	↑10K	↑10K	0Ω		
V2	6BE6	22K	.2Ω	.2Ω	.3Ω	↑400Ω	↑27K	0Ω ←2.6meg		
V3	6BA6	2.2meg	0Ω	3Ω	0Ω	↑1400Ω	↑33K	68Ω		
V4	6BA6	.7Ω	0Ω	.3Ω	0Ω	↑33K	↑66K	68Ω		
V5	6AU6	10K	0Ω	0Ω	.1Ω	↑68K	↑70K	0Ω		
V6	6AL5	INF	INF	0Ω	.1Ω	10K	0Ω	10K		
V7	6AV6	6.8meg	0Ω	0Ω	.1Ω	520K	2.7meg	↑440K		
V8	EM840	3.2meg ←4.8meg	NC	0Ω	0Ω	.1Ω	↑400Ω	↑470K	NC	↑470K
V9	12AX7	↑470K	600K	680Ω	0Ω	0Ω	↑470K	100K	680Ω	.1Ω
V10	EL84 6BQ5	570Ω	570Ω	150Ω	.1Ω	0Ω	NC	↑660Ω	NC	↑400Ω
V11	EL84 6BQ5	570Ω	570Ω	150Ω	1Ω	0Ω	NC	↑660Ω	NC	↑400Ω
V12	5U4GB	NC	¶	NC	95Ω	NC	96Ω	NC	¶	

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
* MEASURED IN "AM" POSITION.
↑ MEASURED FROM PIN 8 OF V12. NC NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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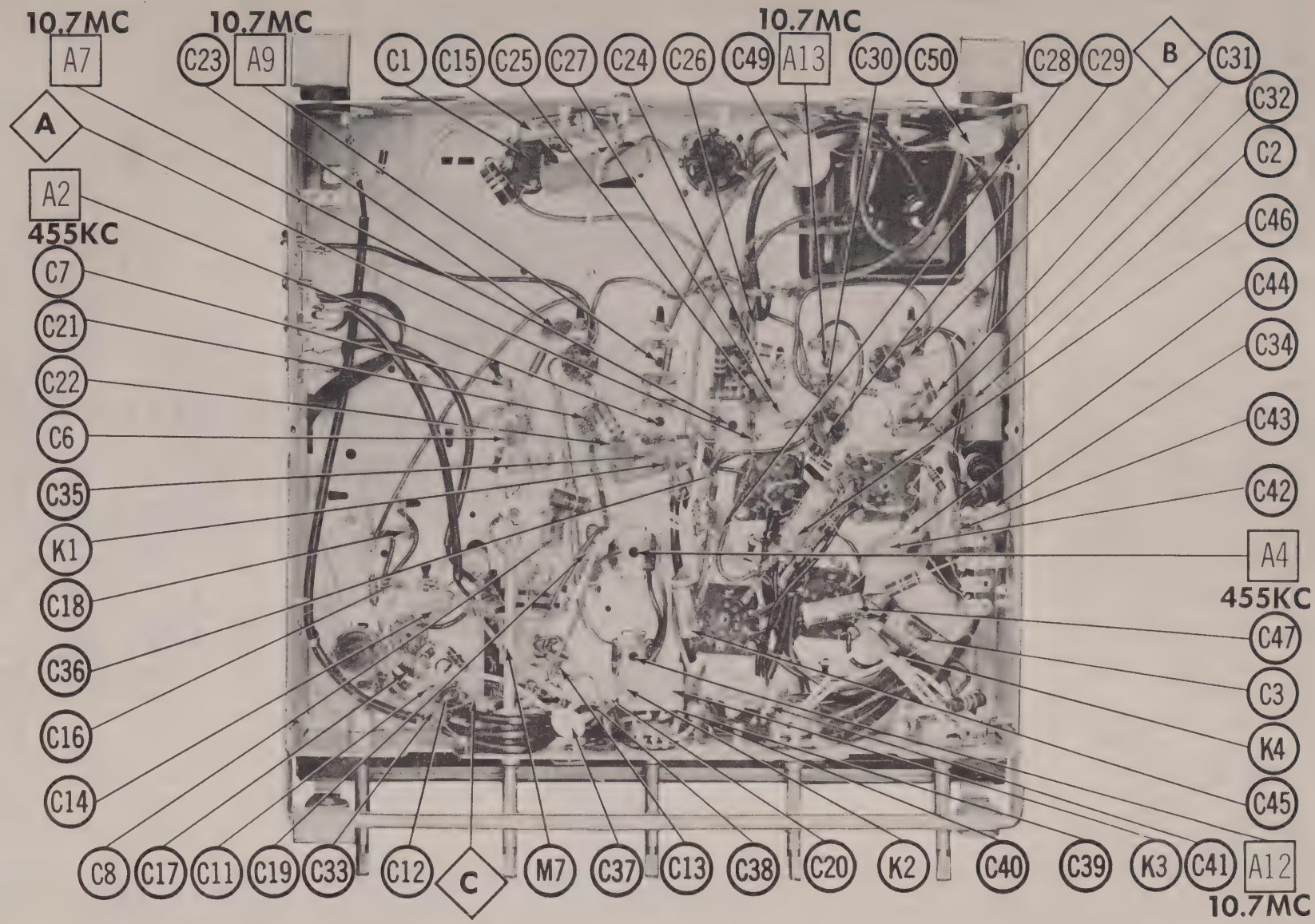
OLYMPIC
MODELS 682, 683



CHASSIS BOTTOM VIEW - CAPACITOR, MISC, & ALIGNMENT IDENT

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested Alignment Tools: A1, A2, A3, A4..... GENERAL CEMENT #8607, 9291, 9294
WALSCO #2520, 2522, 2523, 2524, 2537

A5, A6..... GENERAL CEMENT #5000, 5003, 5004, 5008, 5009, 8276, 8290
WALSCO #2515, 2520, 2523, 2525, 2537

A7, A8, A9, A10, A11, A12, A13, A14. GENERAL CEMENT #8282, 8606, 8606L, 9295
WALSCO #2543, 2544, 2545

A15..... GENERAL CEMENT #5003, 8721, 8722
WALSCO #2512, 2519, 2525

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to AM antenna stator lug of tuning gang. Low side to chassis.	455KC (400~ Mod.)	AM	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.		Loop	1500KC	"	1500KC	"	A5, A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
3.	200mmf	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	10.7MC (Unmod.)	FM	Point of non-interference	DC probe to point (A). Common to chassis.	A7, A8, A9, A10, A11, A12	Adjust for maximum output.
4.	"	"	"	"	"	DC probe to point (B). Common to chassis.	A13	"
5.	"	"	"	"	"	DC probe to point (C). Common to chassis.	A14	Adjust for zero reading. A positive and negative reading will be obtained either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.

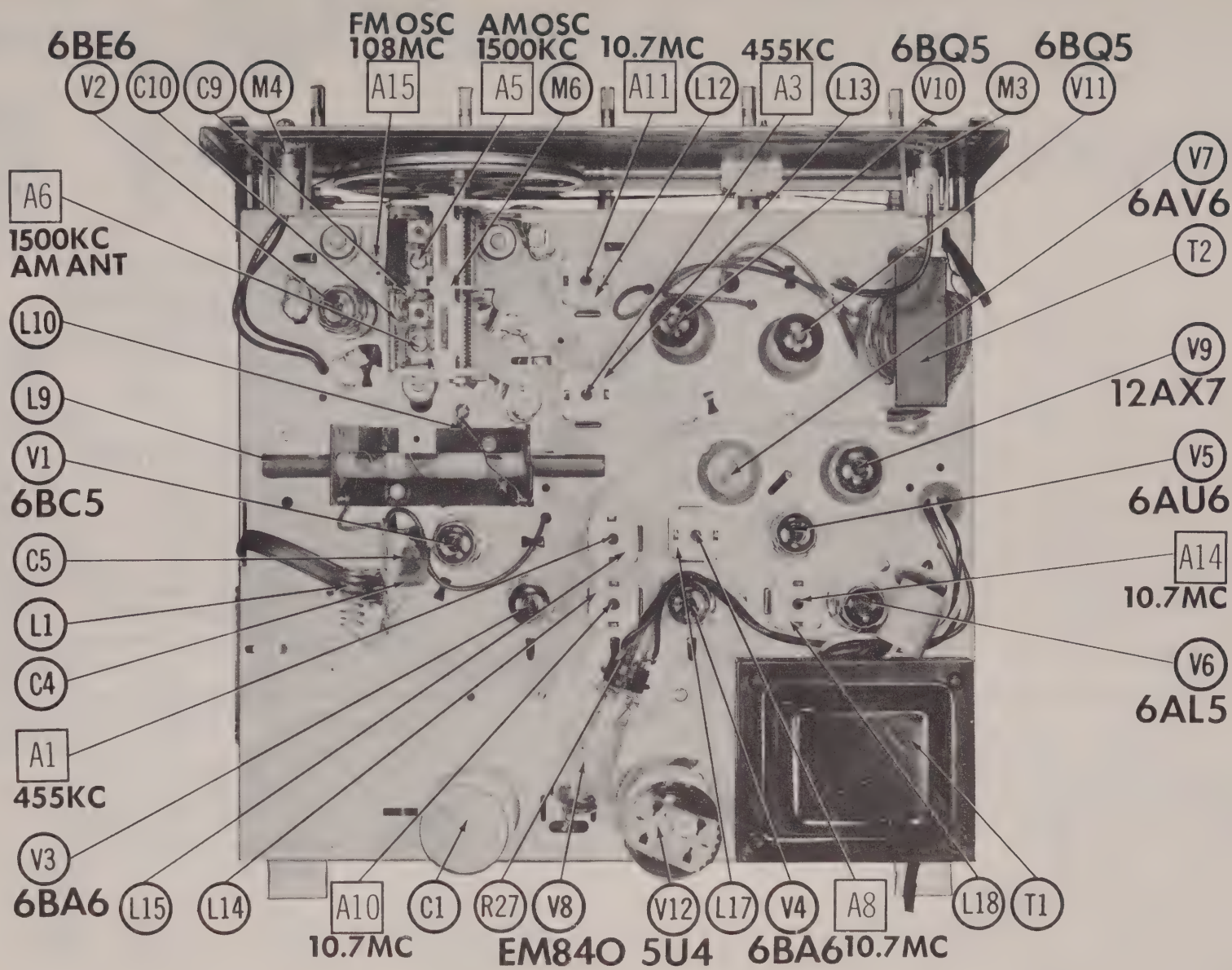
	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
6.	200mmf	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	10.7MC (450KC Swp.)	FM	Point of non-interference	Vert. Amp. to point (A). Low side to chassis.	A7, A8, A9, A10, A11, A12	Disconnect stabilizing capacitor C2. Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
7.	"	"	"	"	"	Vert. Amp. to point (B). Low side to chassis.	A13	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
8.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A14	Reconnect stabilizing capacitor C2. Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A13 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
9.	Two 150Ω Carbon Resistors	To FM antenna terminals with 150Ω in each side.	108MC (Unmod.)	FM	108MC	Across voice coil	A15	Adjust for maximum output.
10.	"	"	88MC	"	88MC	"	L4	Adjust for maximum output by compressing or expanding coil turns. Repeat steps 9 & 10.

FIG. 1

FIG. 2



CHASSIS TOP VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	6BC5	①
V2	FM-AM Converter	6BE6	
V3	1st FM-AM IF Amplifier	6BA6	
V4	2nd FM IF Amplifier	6BA6	
V5	FM Limiter	6AU6	
V6	Ratio Detector	6AL5	

ITEM No.	USE	TYPE	NOTES
V7	AM Det. - AVC - AF Amp.	6AV6	
V8	Tuning Indicator	EM840	
V9	AF Amp. - Phase Inv.	12AX7	
V10	Output	EL84/6BQ5	
V11	Output	EL84/6BQ5	
V12	Rectifier	5U4GB	

① Alternate Type 6AG5

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA OLYMPIC PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	▪30	400	CO-2350	AFH3-45-10	C0290		TMT-46	TVLS-3694*	
B	▪50	400			BR445		TD-4-450		
C	▲4	400							
C2	4	450	CO-1056	PRS450V4	BR445	TC70	TD-4-450	TVA-1702	
C3	20	25	CO-4651	PRS50V20	BBR20-25	TT25X20	TD-25-25	TVA-1410	

* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA OLYMPIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	150			RCM20A151M	1468-00015	D6-151	5W5T15	MC236	1FM-315	
C5	470			CCD471-X	BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C6	1500			CCD152-X	BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C7	470			CCD471-X	BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C8	150			RCM20A151M	1468-00015	D6-151	5W5T15	MC236	1FM-315	
C9	4.7			CO1083	NPO-SI 4.7	TCZ-4R7	CTA6V47C	ZT-5547	5TCCB-V47	
C10	10		NPO	CCD100-K	NPO-DI 10	DTZ-10	C10Q1C	ZT-541	5TCC-Q1	
C11	1-8			CT-1036-1						
C12	68		10%	RCM20A680K	1469-000068	D6-680	22R5Q68		MS-468	
C13	10		N750 10%	CCDU-100K	N750-DI 10	DTN-10	C10Q1U	NT-541	5TCU-Q1	
C14	330			RCM20A331M	1468-00033	D6-331	5W5T33		1FM-333	
C15	.01	600		COH-6103	P688N-01	D6-103	CUB6S1	GEM-611	6TM-S1	
C16	15		NPO 10%	CCD150-K	NPO-DI 15	DTZ-15	C10Q15C		5TCC-Q15	
C17	150		N2200	CCD151-X						
C18	1500			CCD152-X	BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C19	10000			CCD103-X	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C20	10000			CCD103-X	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C21	5000			CCD502-X	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C22	5000			CCD502-X	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C23	10000			CCD103-X	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C24	5000			CCD502-X	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	⑥⑦
C25	5000			CCD502-X	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	⑥⑦

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	REPLACEMENT DATA OLYMPIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C26	10000			CCD103-X	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	②
C27	330			CCD331-M	BPD-00033	DD-331	L10T33	UC-5333	5GA-T33	
C28	10000			CCD103-X	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C29	5000			CCD502-X	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	③
C30	5000			CCD502-X	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	③
C31	150		10%	RCM20A151K	1469-00015	D6-151	22R5T15	MCB236	MS-315	④
C32	150		10%	RCM20A151K	1469-00015	D6-151	22R5T15	MCB236	MS-315	④
C33	2000			CCD202-M	BPD-002	DD-202	BYA10D2	DC522	5HK-D2	④
C34	3300			CCD332-M	BPD-0033	DD-332	BYA10D33	UC-5233	5GA-D33	
C35	.02	400		COH-4203	P488N-02	DD-203	CUB4S2	GEM-412	4TM-S2	②
C36	1000			CCD102-M	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	⑤
C37	50000			CO4765	BPD-05	DF-503			5HK-S5	⑥
C38	50000			CO4765	BPD-05	DF-503			5HK-S5	
C39	1000			CCD102-M	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	②
C40	50000			CO4765	BPD-05	DF-503			5HK-S5	
C41	.1	400		COH-4104	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C42	.22	400		COH-4224	P488N-22		CUB4P22	GEM-4022	4TM-P22	
C43	.1	400		COH-4104	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C44	.047	400		COH-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C45	.002	600		COH-6202	P688N-002	D6-202	CUB6D2	GEM-622	6TM-D2	
C46	.047	400		COH-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C47	.002	600		COH-6202	P688N-002	D6-202	CUB6D2	GEM-622	6TM-D2	
C48	2.0	50								⑦
C49	10000	1400		CO5777	DAC-27	DD16-103	HVE16S1	DC3021	BL-S10	
C50	10000	1400		CO5777	DAC-27	DD16-103	HVE16S1	DC3021	BL-S10	

① In some versions C24, C25 & R11 are combined in one unit (Part #PC25417).
② Not used in some versions.
③ In some versions C29, C30 & R17 are combined in one unit (Part #PC25417).
④ In some versions C31, C32 & C33, R21 & R22 are combined in one unit (Part #PC25504).
⑤ Some versions use 2000mmf in this application (Part #CCD202-M).
⑥ Some versions use 10000mmf in this application (Part #CCD103-X).
⑦ Some versions may use a non-polarized electrolytic in this application (Part #CO3167).

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA OLYMPIC PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1meg	½	PT25614				PP16TD55	Loudness, Tap ③ 250K & 500K
B	Switch						Not Req.	Push Type, 78RPM Scratch Filter
R2A	500K	½	PT5643	BT-64	A47F5-500K	Q19-137X	UT-431	Treble, Tap ③ 250K
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
C	Switch			KB-1 or KR-1*	SWE-12	76-1	US-26	
R3A	1meg	½	PT5644	BT-71	A47-1meg-S	Q11-137	U54	Bass, Tap ③ 500K, Note 1
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	

Note 1. Tap not used in this version.

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	OLYMPIC PART No.	NOTES
R4	1meg		REB105M	
R5	10K	2	RED103M	
R6	27K	2	RED273K	
R7	22K		REB223M	
R8	33K	1	REC333M	
R9	1000Ω		REB102M	
R10	68Ω		REB680K	
R11	33K	1	REC333M	①
R12	33K	1	REC333M	
R13	68Ω		REB680K	
R14	10K		REB103K	
R15	2.2meg		REB225M	
R16	47K		REB473M	
R17	33K		REB333M	②
R18	68K	1	REC683M	
R19	220Ω		REB221M	
R20	1meg		REB105M	
R21	10K		REB103K	③
R22	10K		REB103K	③
R23	22K		REB223M	
R24	470K		REB474M	
R25	2.2meg		REB225M	
R26	2.2meg		REB225M	
R27	470K		REB474M	
R28	2.2meg		REB225M	
R29	330K		REB334M	④
R30	120K		REB124M	⑤
R31	6.8meg		REB685M	
R32	220K		REB224K	
R33	220K		REB224K	
R34	100K		REB104M	
R35	470K		REB474M	
R36	470K		REB474M	
R37	680Ω		REB681M	
R38	270K	1	REB274K	
R39	470K		REB474M	
R40	470K		REB474M	
R41	150Ω	1	REC151K	
R42	400Ω	10WW	RE3396	

① In some versions R11, C24 & C25 are combined in one unit (Part #PC25417).
② In some versions R17, C29 & C30 are combined in one unit (Part #PC25417).
③ In some versions R21, R22, C31, C32 & C33 are combined in one unit (Part #PC25504).
④ Some versions use 390K in this application (Part #REB394M).
⑤ Not used in some versions.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA OLYMPIC PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	FM Ant. Coil	CL2178					
L2	RF Choke	CK5344					3.3 Microhenries ①
L3	FM RF Coil	CL2179					
L4	FM Osc. Coil	CL2179					
L5	Fil. Choke	CK2445	19-1002	BC-563	4606		2.2 Microhenries
L6	Fil. Choke	CK2445	19-1002	BC-563	4606		2.2 Microhenries
L7	Cathode Choke	CK2447					.47 Microhenries ①
L8	RF Choke						2 Turns #20 Bare Wire, Wound on 10Ω
L9	Loopstick	LP5506					
L10	AM Ant. Coil	CK2445	19-1002	BC-563	4606		2.2 Microhenries
L11	AM Osc. Coil	CL1466		BC-397 *	5480-C *		* Drill mounting hole
L12	1st FM IF Trans.	TR2180	16-3487	FM-254	1463		
L13	1st AM IF Trans.	TR1644	16-6758	BC-352	12-C1	RF-1	

COILS (cont)

ITEM No.	USE	REPLACEMENT DATA OLYMPIC PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L14	2nd FM IF Trans.	TR1643	16-3487	FM-254	1463		
L15	2nd AM IF Trans.	TR1644	16-6758	BC-353	12-C2	RF-2	
L16	Fil. Choke	CK2445	19-1002	BC-563	4606		2.2 Microhenries
L17	3rd FM IF Trans.	TR1643	16-3487	FM-254	1463		
L18	Ratio Detector	TR1646	17-3488 ▲	FM-255	1465		

▲ Cut out chassis hole and drill mounting holes.

① IRC Part #CLA.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA OLYMPIC PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V .91A	570VCT @ .100A	5V @ 2A	TR3666	P9209			PM8405	22R05	R-12B
	SEC. 3	SEC. 4	SEC. 5							
	6.3V @ 3.4A									

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA OLYMPIC PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	8400Ω CT	6-8Ω	TR5642	Z1011	A-3027	AU-609	A-3870	26S59	S-55X	

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA OLYMPIC PART No.	QUAM PART No.	NOTES
SP1	12"	PM	3-4Ω	SK5376	12A6A	① Used in Model 683 only.
SP2	8"	PM	3-4Ω	SK1906	8A21	Phase all speakers for singular direction of cone travel.
SP3	4"	PM	3-4Ω	SK4342 ①	4A07	
SP4	4"	PM	3-4Ω	SK4342 ①	4A07	
SP5	4"	PM	3-4Ω	SK4342	4A07	
SP6	3½"	PM	3-4Ω	SK4076	3A15T	

PARTS LIST AND DESCRIPTIONS (Continued)

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	OLYMPIC PART No.	REPLACEMENT DATA
K1	Diode RF Filter	100mmf, 100mmf, 47K	PC2478	Aerovox PA-98 Centralab PC-51 Cornell-Dubilier 111TM2 Sprague D-2
K2	Audio Coupling Network	330mmf, 270K	PC5647	Centralab PC-61 Sprague PRC-2
K3	Tone Compensation Loudness Control	100mmf, 50mmf,(2500mmf Total 100K, 100K	PC25420	Centralab PC-325 Sprague TC-5
K4	Tone Compensation Bass & Treble	4700mmf, 4700mmf, 100mmf, 100K, 470K, 100K, 1000Ω	PC5648	Centralab PC-190 Sprague TC-1

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	OLYMPIC PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1		55-T or 81-TB	GD-J			

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	OLYMPIC PART No.	JENSEN PART No.	WALCO PART No.	
M2		† S-66 or †♦S-66SD or ♦ S-66D	† W-75TPS or †♦W-75DS or ♦ W-75TPD	† Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	OLYMPIC PART No.	NOTES
M3	Lamp	BU187	#47
M4	Lamp	BU187	#47
M5	Lamp	BU187	#47 (Not used in some versions)
M6	Tuning Cap.	CV5891	FM-AM, 4 Gang
M7	Switch	SW2159	Selector (4 Position, Rotary, Wafer Type)

CABINETS & CABINET PARTS

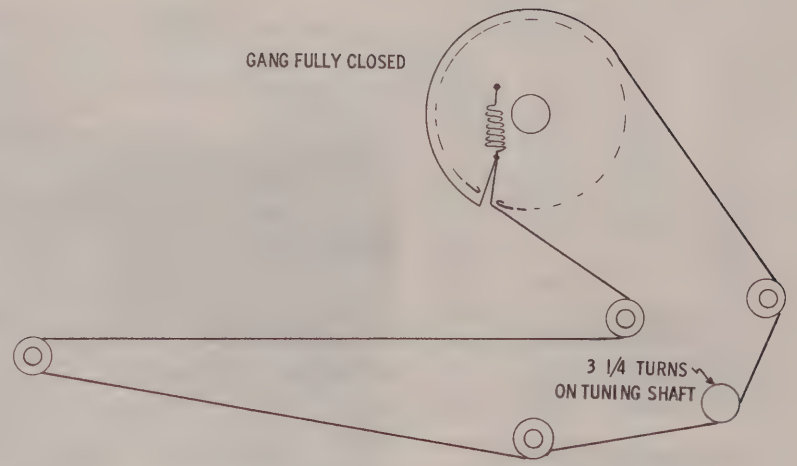
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	KN5768	Tuning
Knob	KN25670	Loudness, Includes RC Pull
Knob	KN25363	Treble-On-Off
Knob	KN25362	Bass
Knob	KN25671	AM-FM-Phono-Stereo
Cabinet	CA25561	Mahogany, Blond or Walnut (Model 683)
Cabinet	CA4819-1	Mahogany, Blond, Ebony or Walnut (Model 682)
Pointer	PO1011	
Dial Glass	DL25611	

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

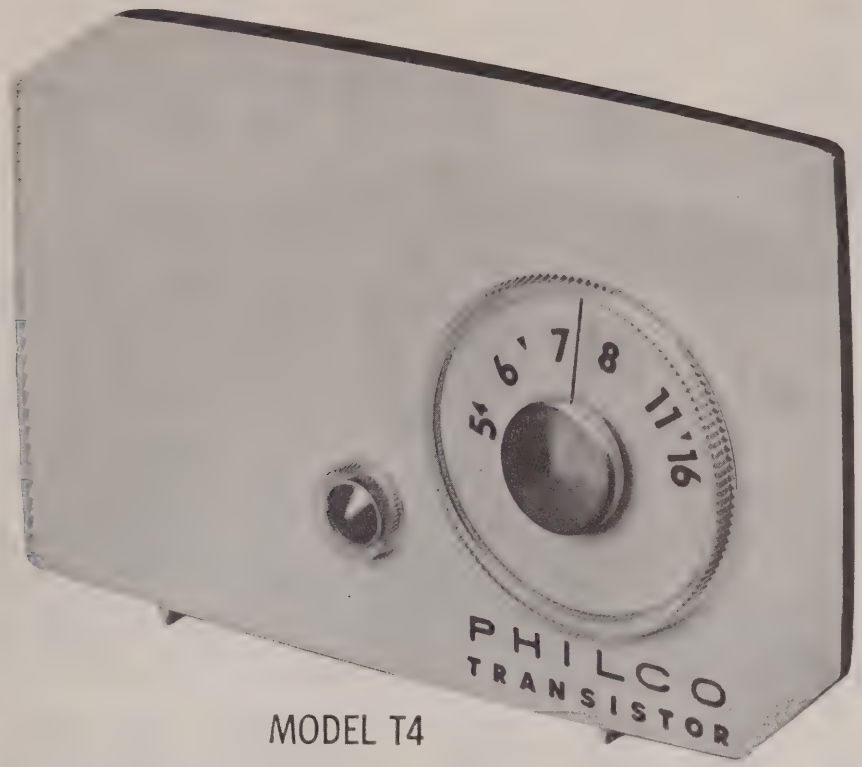
DIAL CORD STRINGING



PHOTOFACT* Folder with CIRCUITRACE*

PHILCO MODELS T4, T4J (Code 124)

PHILCO MODELS T4, T4J (Code 124)



MODEL T4

TRADE NAME	Philco Models T-4, T-4J (Code 124)
MANUFACTURER	Philco Corp., Tioga & "C" Streets, Philadelphia, Pa.
TYPE SET	Battery Operated Portable Transistorized AM Receiver
POWER SUPPLY	6 Volts DC
TUNING RANGE—BROADCAST	535 - 1620KC
RATING	19MA@6 Volts DC (No Signal, Min. Volume) 21MA@6 Volts DC (Signal, Normal Volume)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested alignment tools:

A1, A2, A3..... General Cement #5008, 8195, 8274, 8987, 2728
Walsco #2520

A5..... General Cement #8606, 8606L, 9295
Walsco #2543, 2544, 2545

A4, A6..... General Cement #8607, 5008, 5004
Walsco #2520, 2537

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to antenna stator lug of tuning gang. Low side to B:	455KC (400~ Mod.)	Tuning gang fully open	Across voice coil	A1, A2 A3	Adjust for maximum output.
2.		Loop	1620KC	"	"	A4	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	600KC	600KC	"	A5	Adjust for maximum output while rocking tuning gang. Repeat Steps 2 & 3.
4.		"	1400KC	Tune for 1400KC signal	"	A6	"

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H826

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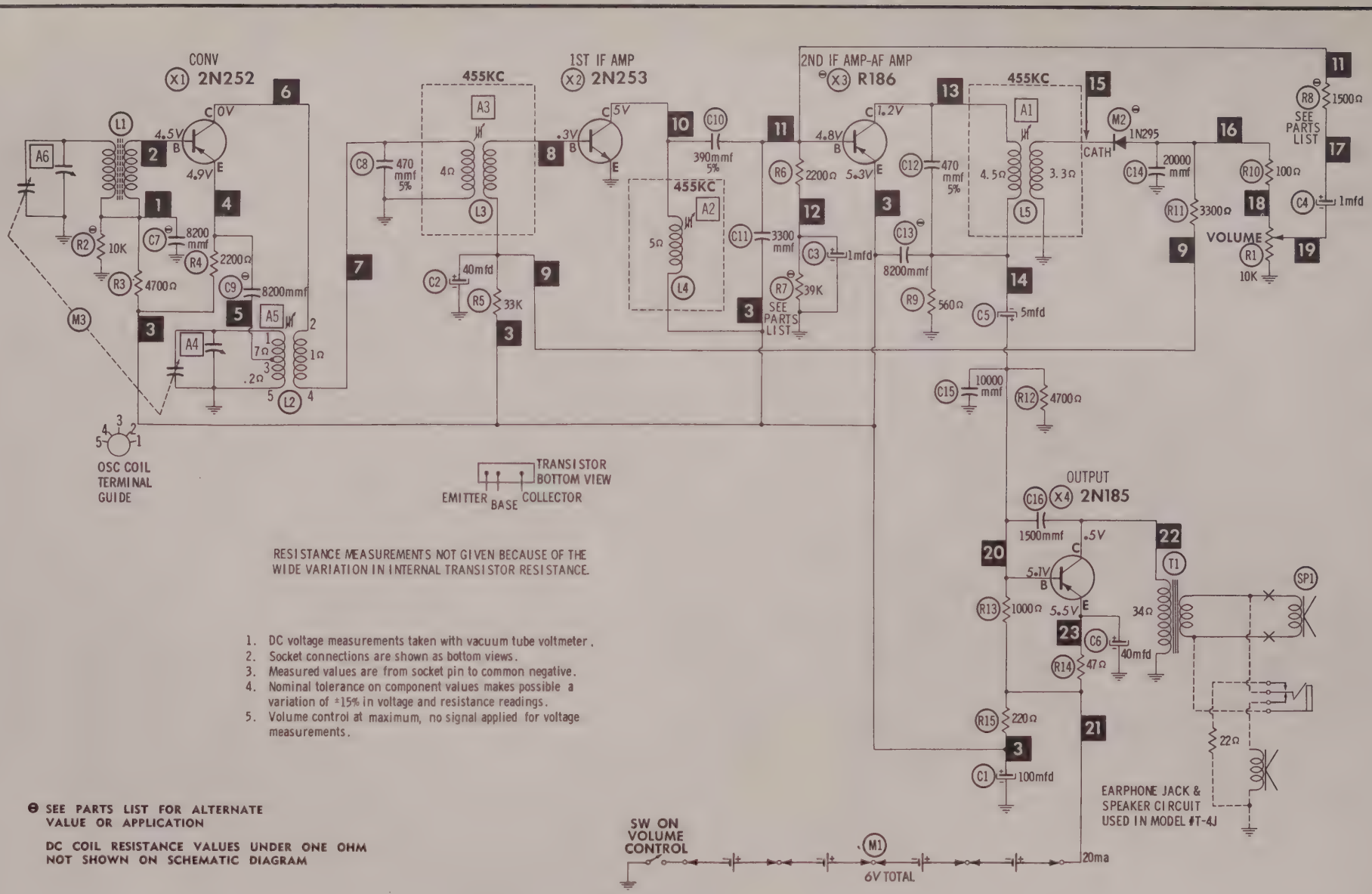
SET 437 FOLDER 10


CONV
X1 2N252
455KC
1ST IF AMP
X2 2N253
2ND IF AMP-AF AMP
X3 R186
455KC
455KC
OUTPUT
C16 X4 2N185
CATH
M2 1N295
SEE PARTS LIST
VOLUME
OSC COIL TERMINAL GUIDE
TRANSISTOR BOTTOM VIEW
EMITTER BASE COLLECTOR
RESISTANCE MEASUREMENTS NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.
1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.
SW ON VOLUME CONTROL
M1
6V TOTAL
20ma
EARPHONE JACK & SPEAKER CIRCUIT USED IN MODEL #T-4J
SP1
T1
⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC
with CIRCUITRACE®

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PHILCO MODELS T4, T4J (Code 124)

PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2N252	Converter	CBS-2N438		2N486	2N140	PNP
X2	2N253	1st IF Amplifier				2N94A	NPN
X3	R186 *	2nd IF Amp. -AF Amp.			2N483	2N139	PNP
X4	2N185	Output			2N631	2N109	PNP

* When replacing X3, R7 and R8 must be replaced. Kit Part #324-8003 may be used.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	PHILCO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	100	6	30-2588-4	PWE6100	NL100-6	TT6X100	ML100-6	MQ-680	TE-1102
C2	40	3	30-2588	PWE3040	NL40-3	TT3X40	ML40-6		TE-1057
C3	1	6	30-2591-8	XPP-6001	NL1-6	TT12X1	ML1-6		TE-1080
C4	1	6	30-2591-8	XPP-6001	NL1-6	TT12X1	ML1-6		TE-1080
C5	5	6	30-2591-7	XPP-6005	NL5-6	TT6X5	ML5-6		TE-1084
C6	40	6	30-2588-3	PWE6040	NL40-6	TT6X40	ML40-6		TE-1095

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C7	8200						B-282		①
C8	470		30-1264-18	1469-00047	MD-471	5R5T47		MS-347	5%
C9	8200						B-282		①
C10	390		30-1264-19	1469-00039	MD-391	5R5T39		MS-339	5%
C11	3300		30-1262-42	BPD-0033	DD-332	BYA10D33	B-233	5HK-D33	
C12	470		30-1262-18	1469-00047	MD-471	5R5T47		MS-347	5%
C13	8200						B-282		①
C14	20000		30-1272-3	BPD-02	DD-203	BYB6S2	B-120	5HK-S2	
C15	10000		30-1238-2	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C16	1500		30-1262-8	BPD-0015	DD-152	BYA10D15	B-215	5HK-D15	

① Some versions may use 8000mmf in this application (Part #30-1262-1).

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	PHILCO PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	10K	½	33-5583-5					Volume & Switch

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		PHILCO PART No.	NOTES
	OHMS	WATT		
R2	10K		66-3108340	Note 1
R3	4700Ω		66-2478340	
R4	2200Ω		66-2228340	
R5	33K		66-3338340	
R6	2200Ω		66-2228340	
R7	39K		66-3398340	Note 2
R8	1500Ω		66-2158340	Note 2

ITEM No.	RATING		PHILCO PART No.	NOTES
	OHMS	WATT		
R9	560Ω		66-1568340	
R10	100Ω		66-1108340	
R11	3300Ω		66-2338340	
R12	47000Ω		66-2478340	
R13	1000Ω		66-2108340	
R14	47Ω		66-0478340	
R15	220Ω		66-1228340	

Note 1. Run #51 & later use 15K in this application (Part #66-3158340).
Note 2. Value of R7 varies between 27K & 390K; R8 from 1000Ω to 5600Ω. Replace with original value. (R7 must be of a value to obtain 1.12 volts (± .12V) across R9.)

PRINTED BOARD

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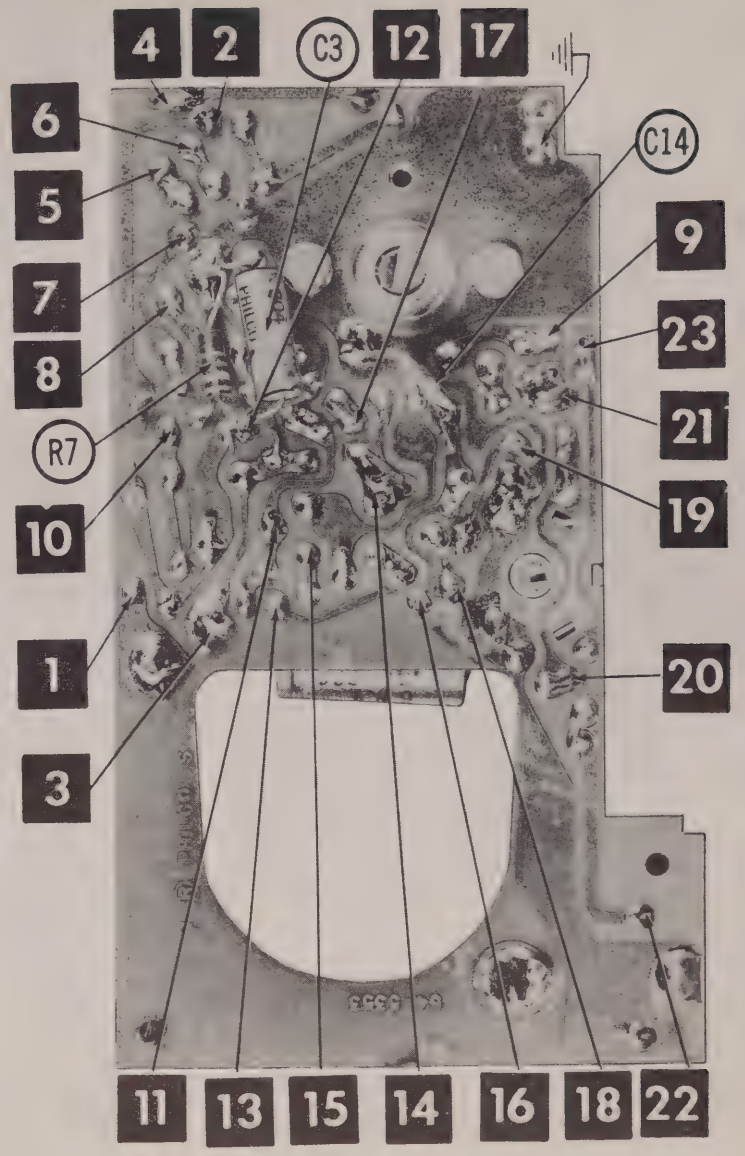


PARTS LIST & DESCRIPTION (continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					
		PHILCO PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Loopstick	32-4761-1					
L2	Osc. Coil	32-4669-5					
L3	1st IF	32-4760-1					
L4	2nd IF	32-4760-2					
L5	3rd IF	32-4760-3					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	PHILCO PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	265Ω	15Ω	32-8819-1						TY-57X ①	① Use original channel frame

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	PHILCO PART No.	QUAM PART No.	
SP1	2 3/4"	PM	15Ω	36-1664-5		

BATTERIES

ITEM No.	VOLTAGE	PHILCO PART No.	REPLACEMENT DATA						NOTES
			BURGESS		EVEREADY		MALLORY		
			"A"	"B"	"A"	"B"	"A"	"B"	
M1	6V			Z ①		915 ① E9 ②		M-15R ① ZM9 ②	① 4 used ② Mercury Type, use 4

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		PHILCO PART No.	CBS PART No.	SYLVANIA PART No.	
M2	1N295 *		1N60	1N295	Detector (Pigtail)

* Some versions may use 1N60 in this application (Part #34-8022-3).

MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M3	Tuning cap. Printed Board	31-2788-1 54-5353	2 Gang, Ant. 4-126mmf

CABINETS & CABINET PARTS

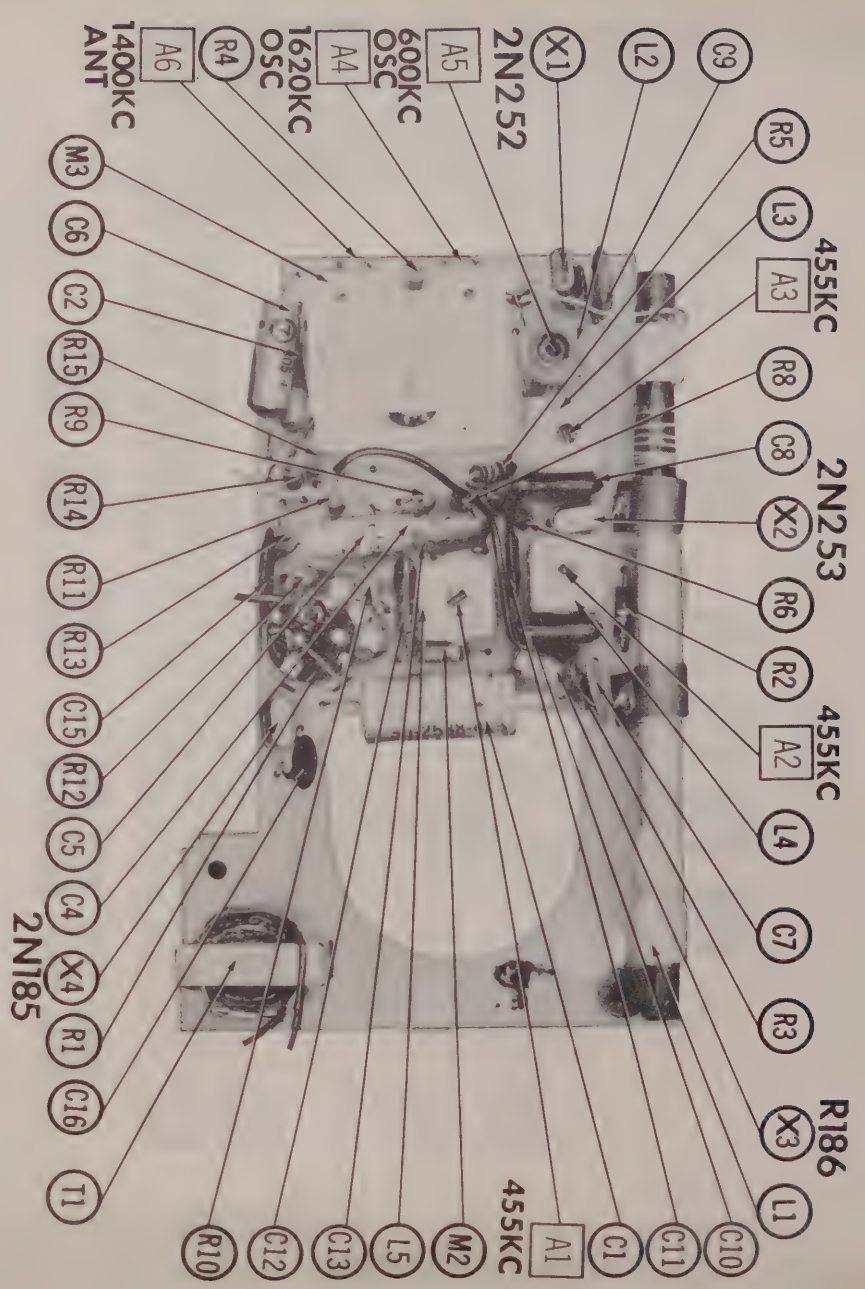
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	54-6659-1	Tuning
Knob	54-6660-1	Off-On-Volume
Cabinet	51-0002	Ivory And Black, Model T-4
Cabinet	51-0002-1	Aqua, Model T-4
Cabinet	51-0002-4	Ebony, Model T4J

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors

CHASSIS—TOP VIEW



PHOTOFACT* Folder

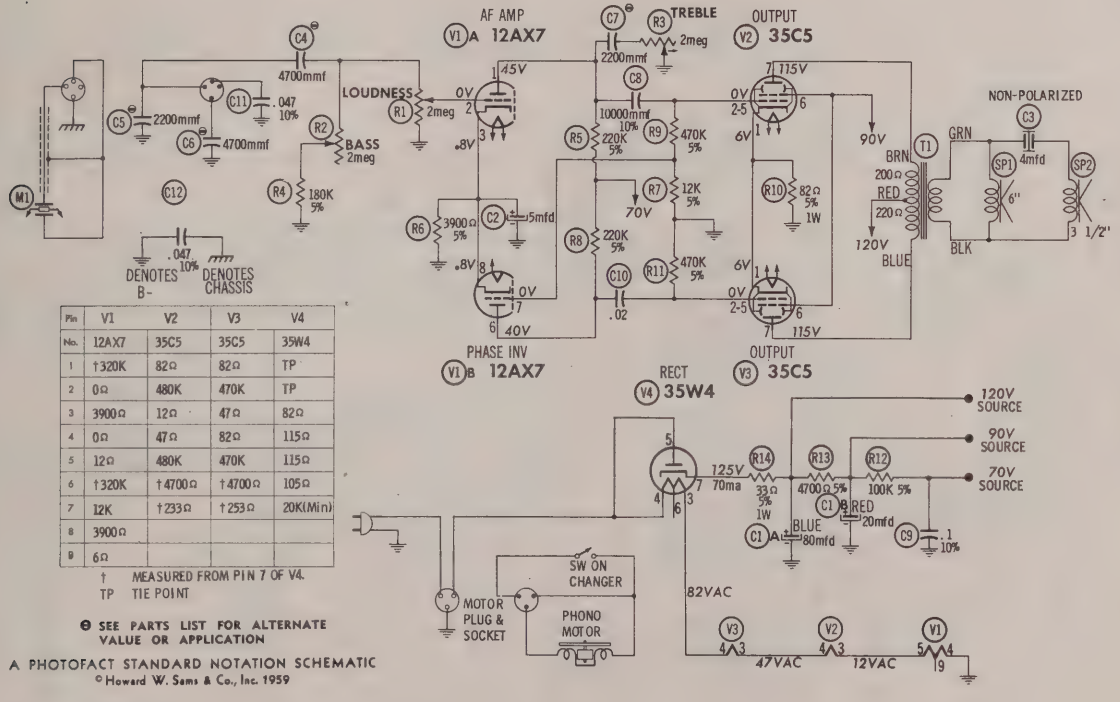
EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

RCA VICTOR MODEL HF99 (Ch. RS-157D)

RCA VICTOR MODEL
HF99 (Ch. RS-157D)

TRADE NAME	RCA Victor Model HF-99 (Ch. RS-157D)
MANUFACTURER	RCA Victor Radio & "Victrola" Div., Radio Corp. of America, Camden 8, N. J.
TYPE SET	AC Operated 4 Tube Phono Amplifier With 4 Speed Automatic Record Changer
POWER SUPPLY	110-120 Volts AC, 60 Cycles RATING 27 Watts, .30 Amp. @ 117 Volts AC (Less Motor)

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE RCA RP205 SERIES - PHOTOFACT SET 358 FOLDER 10 OR RECORD CHANGER MANUAL RC-10.



Pin No.	V1	V2	V3	V4
1	†320K	82Ω	82Ω	TP
2	0Ω	480K	470K	TP
3	3900Ω	12Ω	47Ω	82Ω
4	0Ω	47Ω	82Ω	115Ω
5	12Ω	480K	470K	115Ω
6	†320K	†4700Ω	†4700Ω	105Ω
7	12K	†233Ω	†253Ω	20K(Min)
8	3900Ω			
9	6Ω			

† MEASURED FROM PIN 7 OF V4.
TP TIE POINT

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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RCA VICTOR MODEL
HF99 (Ch. RS-157D)

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp. -Phase Inv.	12AX7	
V2	Output	35C5	
V3	Output	35C5	
V4	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	RCA Victor PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	80	150	101752	PRS150V8020	BBRT44215		TDLT-4	TVLS-2440, 8 *	
B	20	150							
C2	5	6	216333	SRE6V5	BBR5-6	TT6X5	ML5-6	TE-1084	
C3	4	10AC	100565	NP-PRS50V4	BBR8-150	TEN504	TD-8-150 †	TVAS-1110 *	
					BBR8-150		TD-8-150 †		

† Connect negative leads together.
* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	RCA Victor PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	4700			105678	BPD-0047	DD-472	BYA10D47M,	B-247	5HK-D47	Note 1
C5	2200			102223A	BPD-0022	DD-222	BYA10D22	B-222	5HK-D22	Note 1
C6	4700			105678	BPD-0047	DD-472	BYA10D47M,	B-247	5HK-D47	Note 1
C7	2200			102223A	BPD-0022	DD-222	BYA10D22	B-222	5HK-D22	Note 1
C8	10000		10%	73960					5BF-P10	
C9	.1	400	10%	73551					4TM-S2	
C10	.02	400		73810	P488N-02	DD-203	CUB4S2	GEM-412	5BF-S47	
C11	.047	400	10%	73553					5BF-S47	
C12	.047	400	10%	73553						

① Original manufacturer's part number is for a paper tubular unit which may be used in this application.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	RCA Victor PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2meg	½	106176	B-75	A47-2meg-Z	Q13-139	U55	Loudness
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R2A	2meg	½	106176	B-75	A47-2meg-Z	Q13-139	U55	Bass
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R3A	2meg	½	106176	B-75	A47-2meg-Z	Q13-139	U55	Treble
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

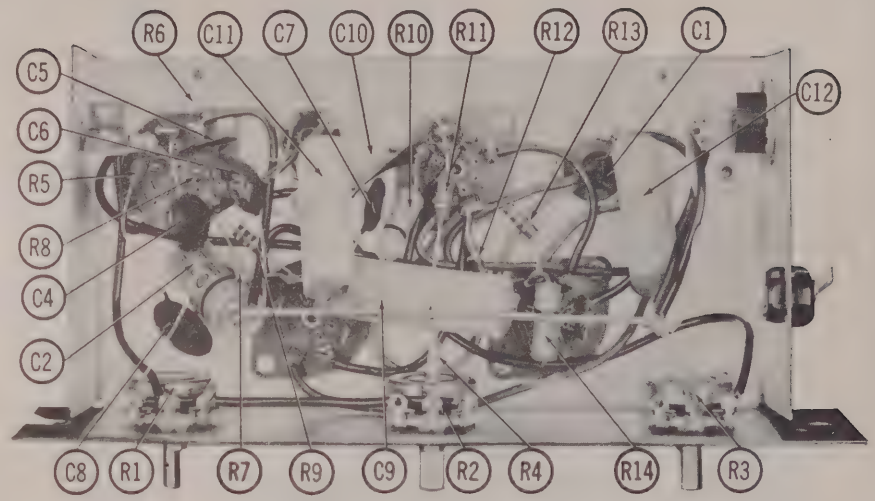
ITEM No.	RATING OHMS	RATING WATT	RCA Victor PART No.	NOTES
R4	180K 5%		502418	
R5	220K 5%		502422	
R6	3900Ω 5%		502239	
R7	12K 5%		502312	
R8	220K 5%		502422	
R9	470K 5%		502447	

ITEM No.	RATING OHMS	RATING WATT	RCA Victor PART No.	NOTES
R10	82Ω 5%	1	512082	
R11	470K 5%		502447	
R12	100K 5%		502410	
R13	4700Ω 5%		502247	
R14	33Ω 5%	1	512033	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	RCA Victor PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	3700Ω CT	3-4Ω	103312	Z1001	A-2900	AU-608	A-3856	24S80	S-51X	

CHASSIS-BOTTOM VIEW



SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	RCA Victor PART No.	QUAM PART No.	NOTES
SP1	6"	PM	3-4Ω	100464	6A21	
SP2	3½"	PM	6-8Ω	105395	3A15TZ6.4	

PHONO CARTRIDGE

ITEM No.	RCA Victor PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	JENSEN PART No. CARTRIDGE	JENSEN PART No. NEEDLE	REMARKS
M1	105836 ①	81-T				① Includes needle

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	103295	Speed Control, Includes Shaft Assembly
Knob	106175	Loudness, Bass, Treble
Cabinet Assembly	X4349	
Handle	104657	

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

PHOTOFACT* Folder with CIRCUITRACE*

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

STANDARD
MODEL SR-F22

STANDARD
MODEL SR-F22

STANDARD
MODEL SR-F22

TRADE NAME	Standard Model SR-F22
IMPORTER	Polyrad Corp., 521 Broadway, Cincinnati 2, Ohio
TYPE SET	Battery Operated Portable Transistorized AM Receiver
POWER SUPPLY	9 Volts DC
RATING	3.9MA @ 9 Volts DC (No Signal, Min. Volume) 8MA @ 9 Volts DC (Signal, Normal Volume)
TUNING RANGE—BROADCAST	540 - 1620KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.

Suggested alignment tools:
A1, A2, A3, A5..... General Cement #9294, 8195, 9291, 8728, 8275
Walsco #2534, 2520, 2522, 2537, 2538
A4, A6..... General Cement #8276, 5066, 8290, 5003, 9087
Walsco #2525

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.		Loop	455KC (400∿ Mod.)	Tuning gang fully open	Across voice coil	A1, A2, A3	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
2.		"	1600KC	1600KC	"	A4	"
3.		"	600KC	600KC	"	A5	Adjust for maximum output while rocking tuning gang. Repeat Steps 2 & 3.
4.		"	1400KC	Tune for 1400KC signal	"	A6	Adjust for maximum output.

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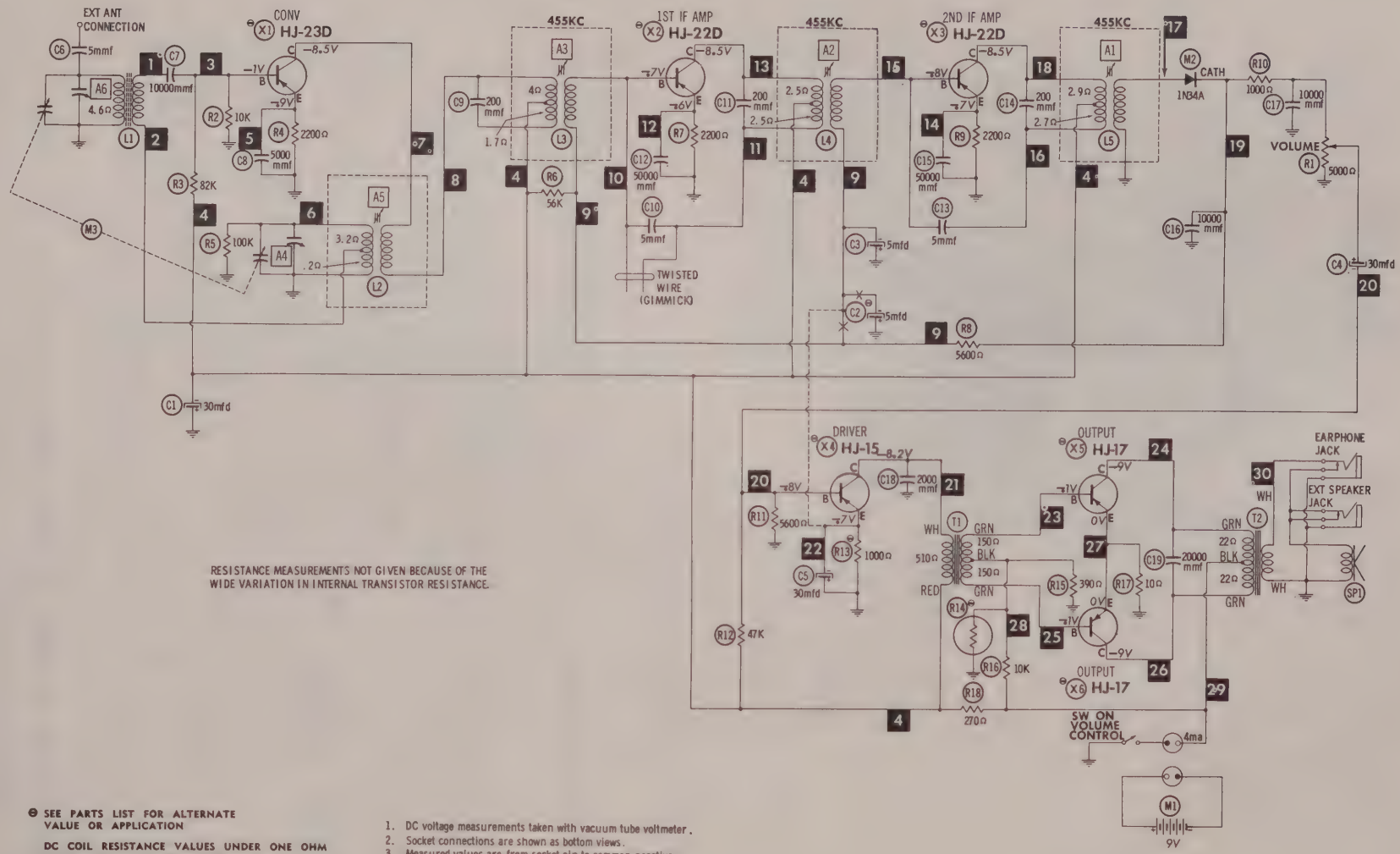
H825

SET 437 FOLDER 12



RESISTANCE MEASUREMENTS NOT GIVEN BECAUSE OF THE WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE

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1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ±15% in voltage readings.
5. Volume control at maximum, no signal applied for voltage measurements.

STANDARD
MODEL SR-F22

PARTS LIST AND DESCRIPTIONS

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	HJ-23D	Converter		2N140	2N486	2N140	PNP ①
X2	HJ-22D	1st IF Amplifier		2N139	2N483	2N139	PNP ②
X3	HJ-22D	2nd IF Amplifier		2N139	2N483	2N139	PNP ②
X4	HJ-15	Driver		2N104	2N362	2N109	PNP ③
X5	HJ-17D	Output		2N109	2N632	2N109	PNP ④
X6	HJ-17D	Output		2N109	2N632	2N109	PNP ④

① Alternate types HJ-23, 2N140
② Alternate types HJ-22A, 2N139
③ Alternate type 2N104
④ Alternate types HJ-17, 2N109

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	STANDARD PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	30	10	CD-217	XPP-10030	NL30-15	TT15X30	ML30-15	MQ-0130	TE-1158
C2	5	6	CD-220 ①	XPP-6005	NL5-6	TT6X5	ML5-6		TE-1084
C3	5	6	CE-220	XPP-6005	NL5-6	TT6X5	ML5-6		TE-1084
C4	30	6	CD-211	PWE6030	NL30-6	TT6X30	ML30-6	MQ-130	TE-1092
C5	30	6	CD-211	PWE6030	NL30-6	TT6X30	ML30-6	MQ-130	TE-1092

① Not used in some versions.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	STANDARD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C6	5		C-507						
C7	10000		CD-602					TG-S10	
C8	5000		CD-604					TG-D50	
C9	200		C-510						
C10	5		C-507						
C11	200		C-510						
C12	50000		CD-600					TG-S50	
C13	5		C-507						
C14	200		C-510						
C15	50000		CD-600					TG-S50	
C16	10000		CD-602					TG-S10	
C17	10000		CD-602					TG-S10	
C18	2000		CD-605						
C19	20000		CD-601						

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	STANDARD PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	5000Ω	½	RD-116					Volume & Switch

PRINTED BOARD

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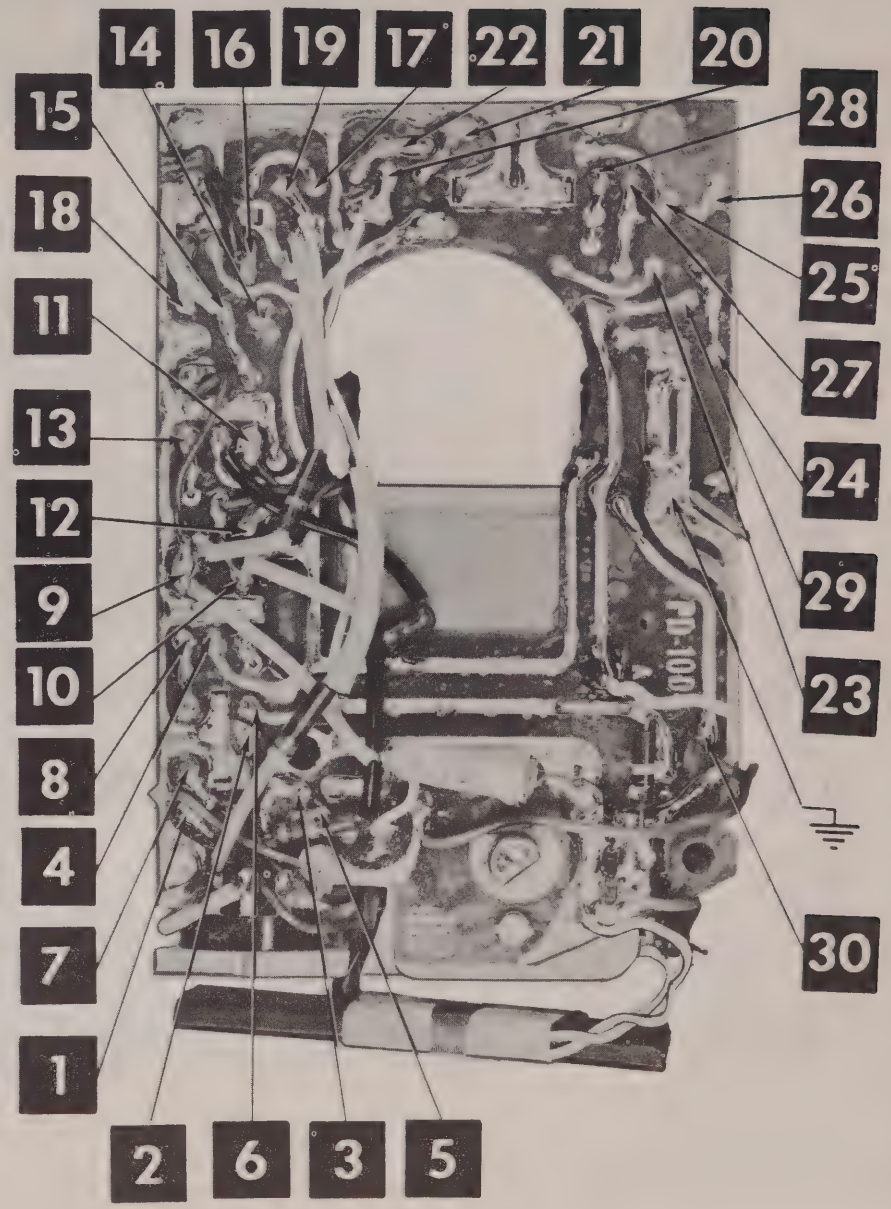


PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	STANDARD PART No.	NOTES
R2	10K		RC-4Y10K	
R3	82K		RC-4Y82K	
R4	2200Ω		RC-4Y2.2K	
R5	100K		RC-4Z100K	
R6	56K		RC-4Z56K	
R7	2200Ω		RC-4Z2.2K	
R8	5600Ω		RC-4Z5.6K	
R9	2200Ω		RC-4Y2.2K	
R10	1000Ω		RC-4Z1K	
R11	5600Ω		RC-4Y5.6K	①
R12	47K		RC-4Y47K	
R13	1000Ω		RC-4Y1K	
R14	Thermistor			
R15	390Ω		RC-5Y390	
R16	10K		RC-5Y10K	
R17	10Ω		RD-230B	
R18	270Ω		RC-4Z270	

① Some versions use 2200Ω in this application (Part #RC-4Y2.2K).

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA: STANDARD PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Loopstick	LT-125K					
L2	Osc. Coil	LT-215					
L3	1st IF	LT-315A					
L4	2nd IF	LT-315B					
L5	3rd IF	LT-315C					

TRANSFORMER (DRIVER)

ITEM No.	TURNS RATIO PRI.	TURNS RATIO SEC.	REPLACEMENT DATA: STANDARD PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	1.4	: 1	LT-421						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA: STANDARD PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	900Ω CT	10Ω	LT-416	GH107			TA-25			

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA: STANDARD PART No.	QUAM PART No.	NOTES
SP1	2 1/2"	PM	10Ω			

BATTERIES

ITEM No.	VOLTAGE	STANDARD PART No.	REPLACEMENT DATA: BURGESS "A"	BURGESS "B"	EVEREADY "A"	EVEREADY "B"	MALLORY "A"	MALLORY "B"	NOTES
M1	9V	BL-006P		2U6		216		TR-146R	

CRYSTAL DIODES

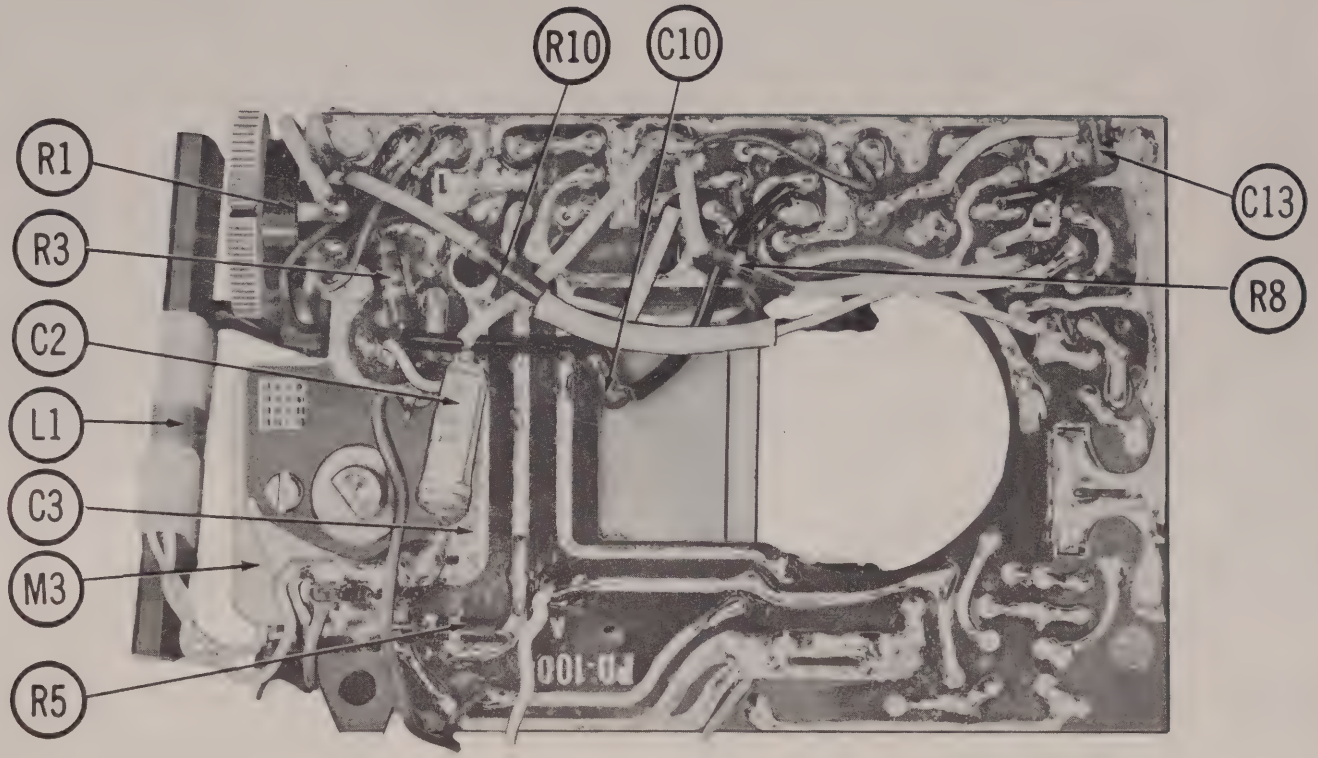
ITEM No.	ORIG. TYPE	REPLACEMENT DATA: STANDARD PART No.	CBS PART No.	SYLVANIA PART No.	NOTES
M2	1N34A		1N34A	1N38A	Detector (Pigtail)

MISCELLANEOUS

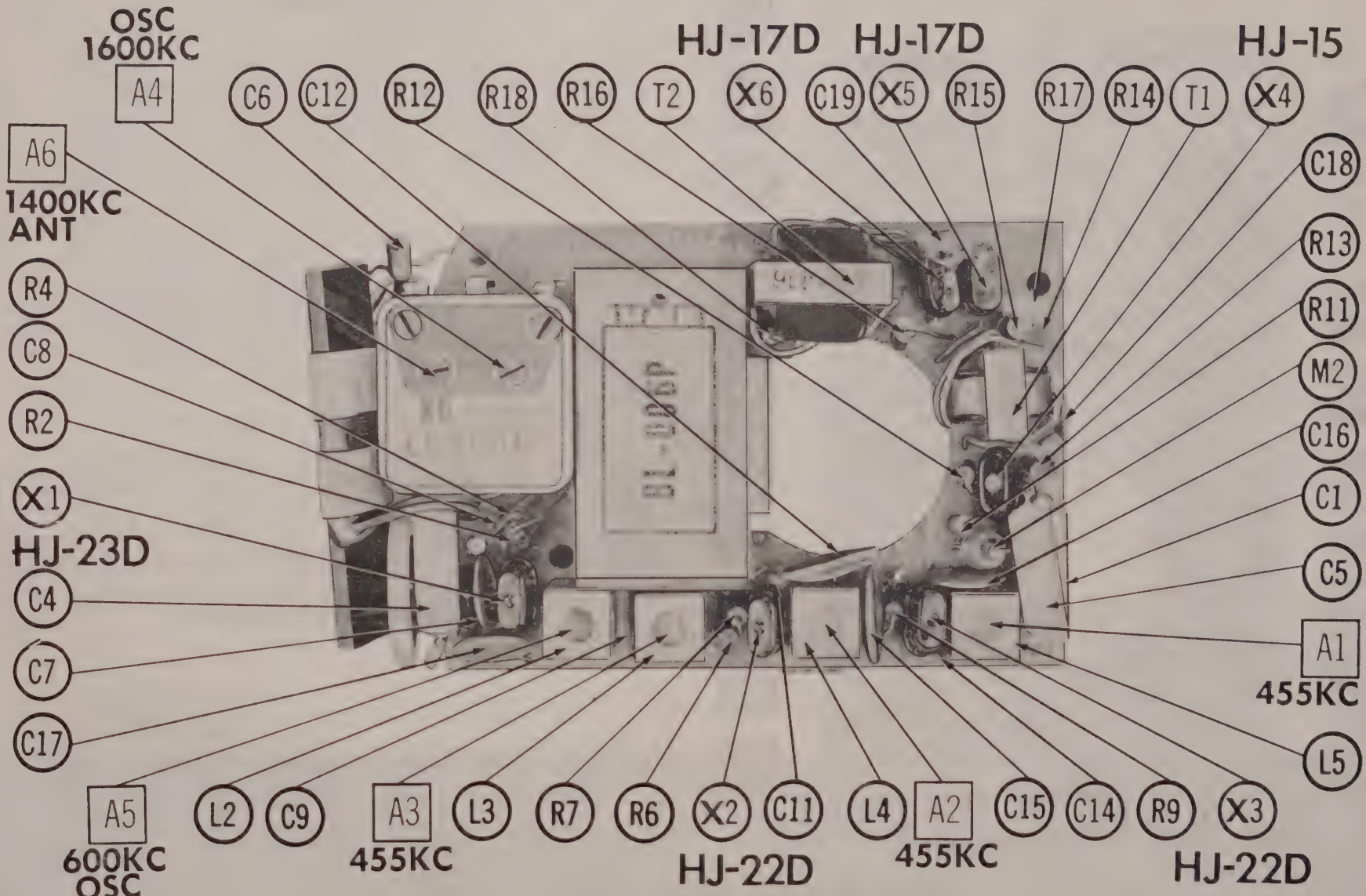
ITEM No.	PART NAME	STANDARD PART No.	NOTES
M3	Tuning Cap. Printed Board	CD-118 PD-1004	2 Section

WIRING DATA

General-use Unshielded Hook-up Wire .....Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors



CHASSIS BOTTOM VIEW



CHASSIS TOP VIEW

PHOTOFACT* Folder

STEELMAN MODELS 4A31, 4A32L, 4A32T, 4A35, 4A36

STEELMAN MODELS 4A31, 4A32L, 4A32T, 4A35, 4A36

MODEL 4A36

STEELMAN MODELS 4A31, 4A32L, 4A32T, 4A35, 4A36

TRADE NAME	Steelman Models 4A31, 4A32L, 4A32T, 4A35, 4A36
MANUFACTURER	Steelman Phono & Radio Co., Inc., 2-30 Anderson Ave., Mount Vernon, N. Y.
TYPE SET	AC Operated Phono Amplifier With 4 Speed Automatic Record Changer
TUBES	Three
POWER SUPPLY	110 -120 Volts AC, 60 Cycles RATING 32 Watts, .36 Amp. @117 Volts AC (Less Motor)

FOR SERVICE INFORMATION ON RECORD CHANGER -SEE V-M 1200A - PHOTOFACT SET 353 FOLDER 16
OR RECORD CHANGER MANUAL RC-10.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1959 Howard W. Sams & Co., Inc., Indianapolis 6, Indiana. Printed in U.S. of America

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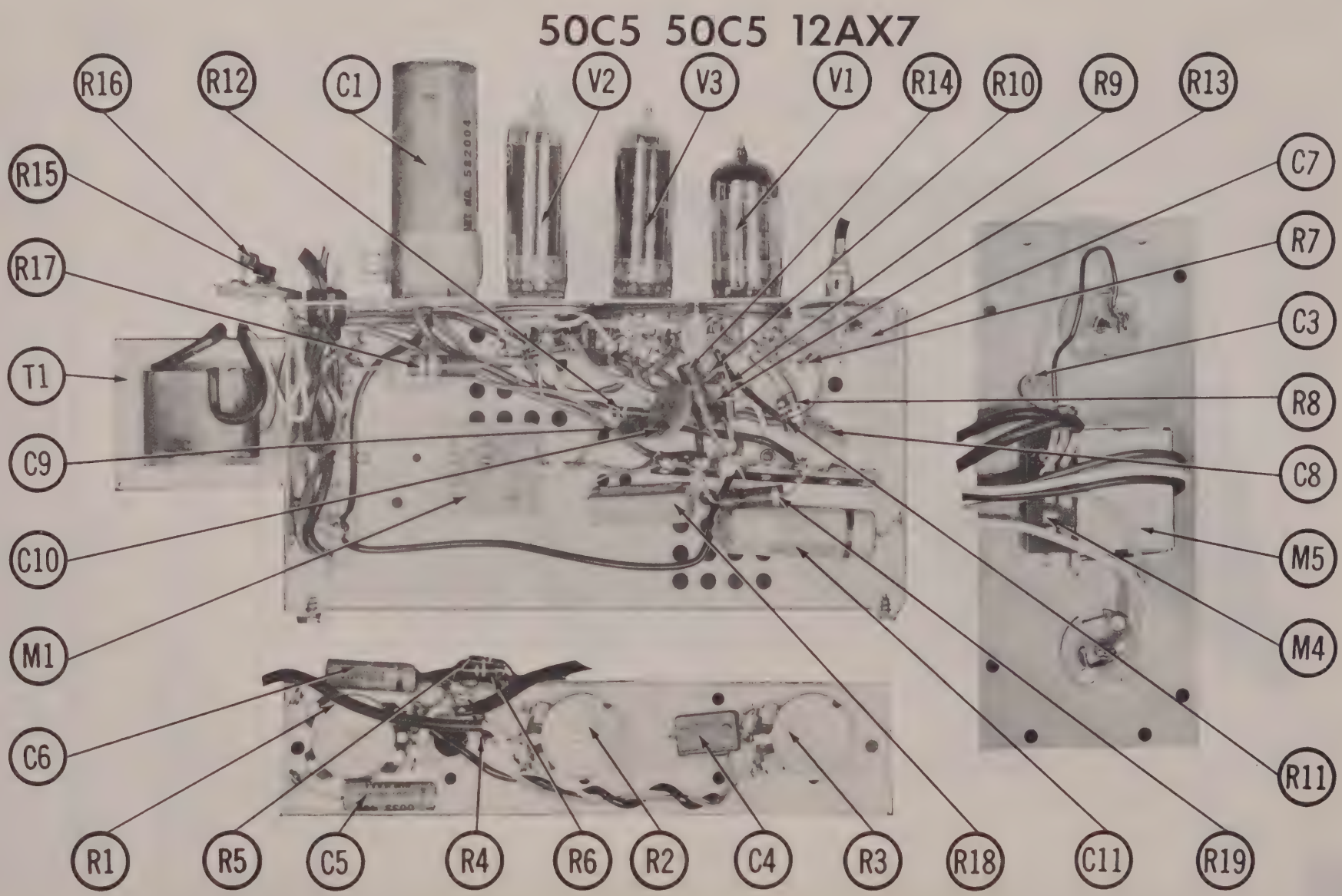


CHASSIS-BOTTOM VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp. -Phase Inv.	12AX7	
V2	Output	50C5	
V3	Output	50C5	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	STEELMAN PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.	NOTES
C1A	80	150	582004	PRS150V8050	BBRD8515	TCD498	TDLD-12	TVA-2462	
B	50	150							
C2	2	50NP	581019 ①	NP-PRS50V2	BBR4-50† BBR4-50	TT50X4† TT50X4	TD-4-50† TD-4-50	R2233*	

① Used on Model 4A36 only.
† Connect negative leads together.
* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	RATING TOL	STEELMAN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C3	1000				BPD-001	DD-102	BYA6D1	DC521	5HK-D1	①
C4	560				1467-00056	D6-561	1W5T56		1FM-356	②
C5	.0033	400			P488N-0033	D6-332	CUB6D33	GEM-6233	6TM-D33	③
C6	.0033	400			P488N-0033	D6-332	CUB6D33	GEM-6233	6TM-D33	③
C7	10000				BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C8	10000				BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C9	10000				BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C10	10000				BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C11	.1	400			P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	

① Some versions may use 1500mmf in this application.
② Some versions may use 470mmf in this application.
③ Some versions may use 1000mmf in this application.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	STEELMAN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	3.25meg	½	368009					Loudness, Tap ⓐ 1meg & 2.5meg
R2A	250K	½	360265	B-50	A47-250K-S	Q11-130	U46	Treble
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R3A	5meg	½	360330	B-88	A47-5meg-Z	Q13-141	U65	Bass
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	STEELMAN PART No.	NOTES
R4	100K			
R5	100K			
R6	100K			
R7	10meg			
R8	270K			
R9	47K			
R10	10meg			
R11	270K			
R12	470K			
R13	470K			
R14	100Ω	1		
R15	100K			
R16	4700Ω			
R17	39Ω	1		
R18	50Ω	5	510002	
R19	1000Ω	1		

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA STEELMAN PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	3500Ω CT	3-4Ω Tap ⓐ 1-2Ω	430222	Z1001						

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA STEELMAN PART No.	QUAM PART No.	NOTES
SP1	12"	PM	3-4Ω	409004 ①	12A6A	① Used in Model 4A36
SP2	4"	PM	3-4Ω	404009 ①	4A1TZ4.7	② Used in Model 4A35
	6"	PM	3-4Ω	406004 ⑤ ②		③ Used in Model 4A31
	7"	PM	3-4Ω	408001 ③	7A31	④ Used in Models 4A32T, 4A32L
	6"	PM	3-4Ω	406002 ⑤ ④ ②		⑤ Parallel And Phase
SP3	4"	PM	3-4Ω	404009 ①	4A1TZ4.7	
	Electrostatic			409001 ④		
	Electrostatic			409001 ② ③ ④		

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT (Measured)	REPLACEMENT DATA STEELMAN PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	NOTES
M1	.092A	380002 ①	1235AH	T100 SD-94 ②	100A K200 ②	① Part #380022 used in Model 4A35. Part #380062 used in Model 4A31. ② Silicon Type.

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA STEELMAN PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	JENSEN PART No. CARTRIDGE	JENSEN PART No. NEEDLE	REMARKS
M2	322517	118-TS	N8-1 and N8-3			

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA STEELMAN PART No.	JENSEN PART No.	WALCO PART No.	REMARKS
M3	329307 (78)	† CRA-55 or ♦ CRA-55D	† W-64S or ♦ W-64D	† Jewel ♦ Diamond
	329107 (LP)	† CRA-55LP or ♦ CRA-55LPD	† W-64MGS or ♦ W-64MGD	

MISCELLANEOUS

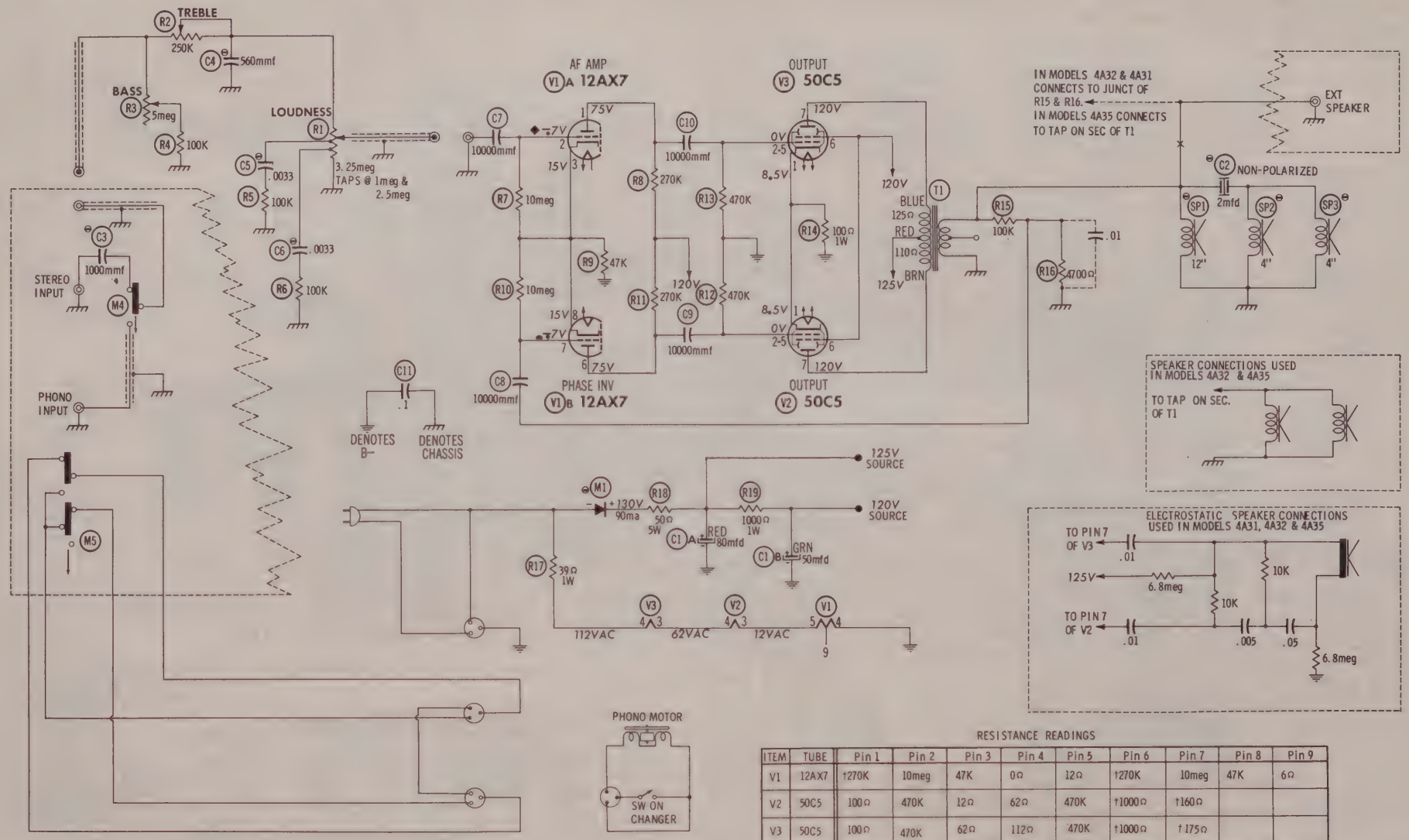
ITEM No.	PART NAME	STEELMAN PART No.	NOTES
M4	Switch	370038	Stereo-Phono (SS-12, SPDT, Slide Type)
M5	Switch	370045	Stereo-Phono (SS-150, DPDT, Slide Type)
	Switch	370046	Speaker Selector

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

STEELMAN MODELS 4A31, 4A32L, 4A32T, 4A35, 4A36

FOLDER 13



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	†270K	10meg	47K	0Ω	12Ω	†270K	10meg	47K	6Ω
V2	50C5	100Ω	470K	12Ω	62Ω	470K	†1000Ω	†160Ω		
V3	50C5	100Ω	470K	62Ω	112Ω	470K	†1000Ω	†175Ω		

† MEASURED FROM OUTPUT OF M1.
• MEASURED FROM PIN 3 OF V1.
▪ MEASURED FROM PIN 8 OF V1.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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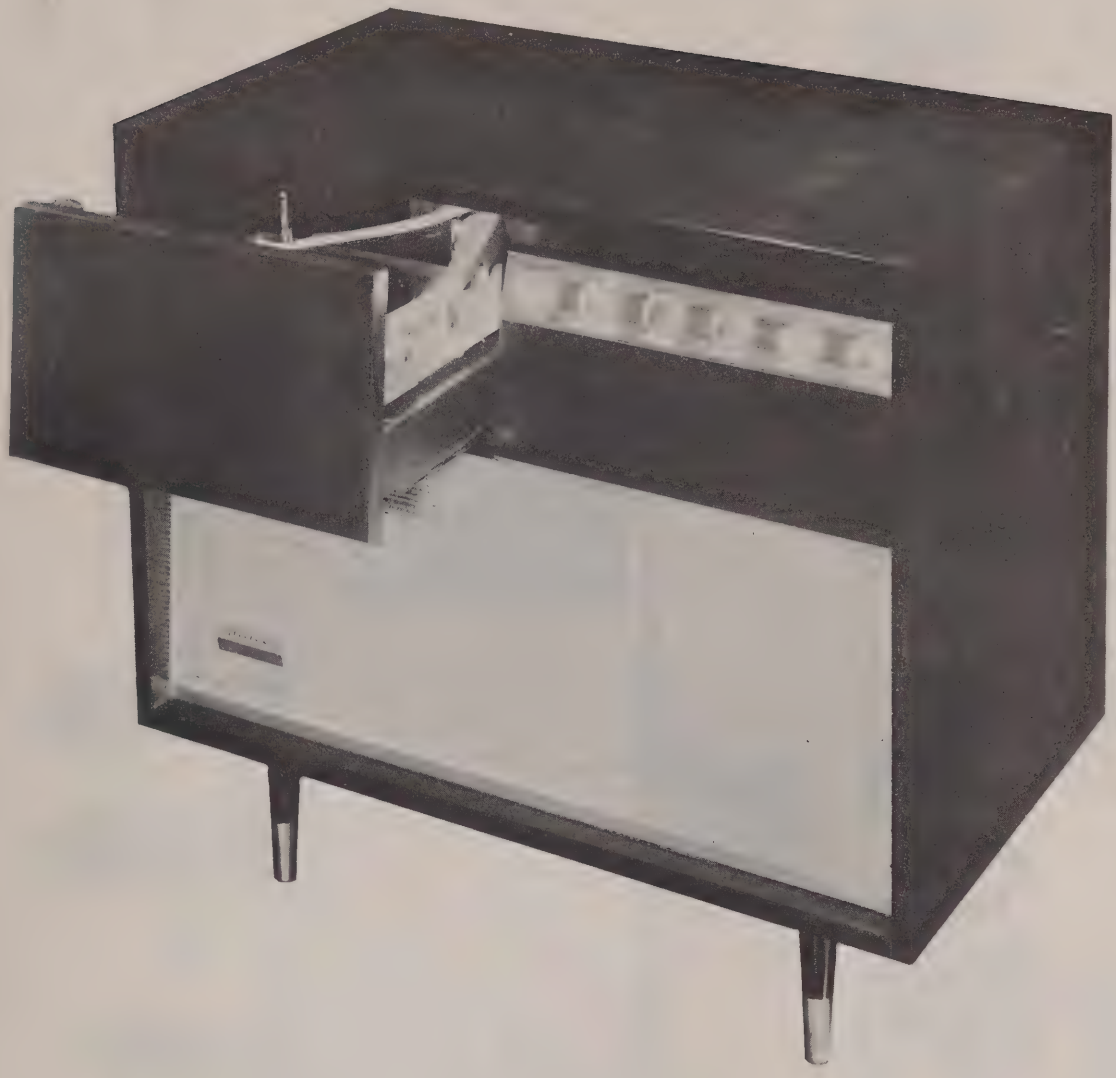
STEELMAN MODELS 4A31, 4A32L, 4A32T, 4A35, 4A36

PHOTOFACT* Folder

STEELMAN
MODEL 4A37

STEELMAN
MODEL 4A37



STEELMAN
MODEL 4A37

TRADE NAME	Steelman Model 4A37
MANUFACTURER	Steelman Phono & Radio Co., Inc., 2-30 Anderson Ave., Mount Vernon, N. Y.
TYPE SET	AC Operated Phono Amplifier With 4 Speed Automatic Record Changer
TUBES	Four
POWER SUPPLY	110 - 120 Volts AC - 60 Cycles RATING 42 Watts, .43 Amp. @ 117 Volts AC (Less Motor)

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE V-M 1200A - PHOTOFACT SET 353 FOLDER 16 OR RECORD CHANGER MANUAL RC-10.

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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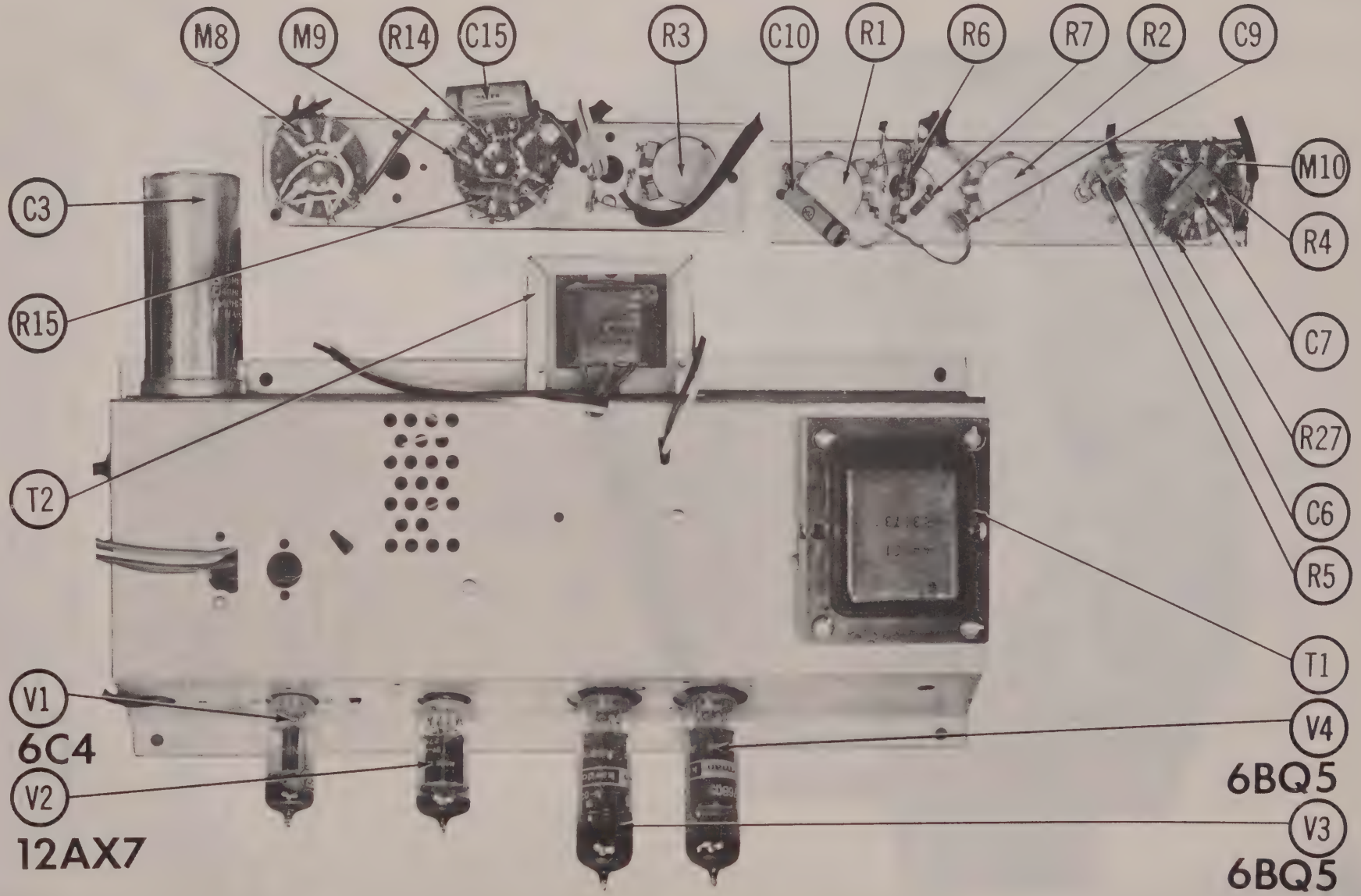
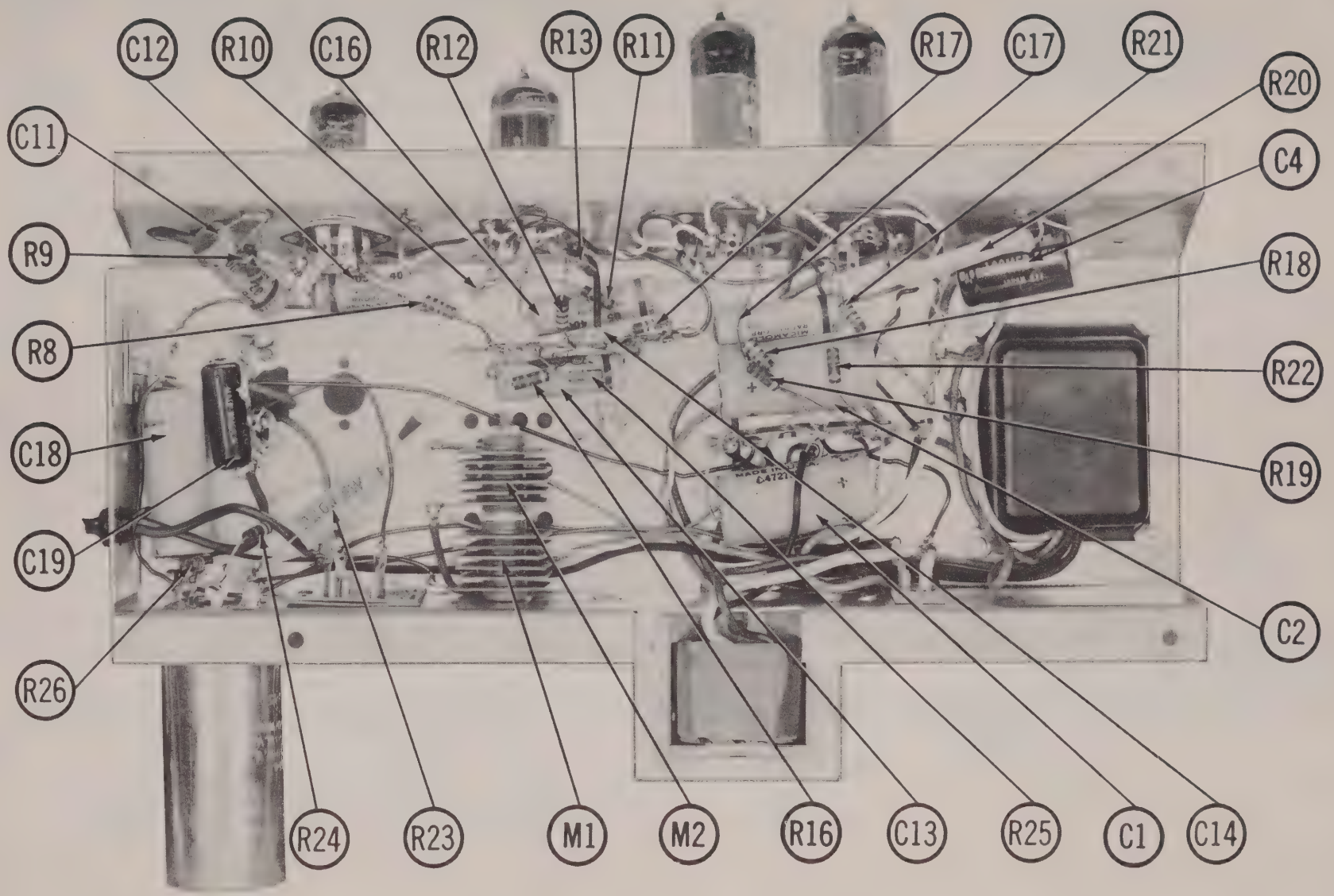


CHASSIS-TOP VIEW



CHASSIS-BOTTOM VIEW

PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	STEELMAN PART No.	QUAM PART No.	
SP1	12"	PM	3-4Ω	409005 ①	12A6A ①	① Parallel and Phase
SP2	8"	PM	3-4Ω	408001 ①	7A31 ①	② Parallel and Phase
SP3	4"	PM	4-6Ω	404009 ②	4A1TZ4.7 ②	
SP4	4"	PM	4-6Ω	404009 ②	4A1TZ4.7 ②	

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	STEELMAN PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.074A	360002	1235AH	T100 SD-94 ①	100A K200 ①	① Silicon Type
M2	.074A	360009	1235AH	T100 SD-94 ①	100A K200 ①	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	STEELMAN PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M3	322517	118-TS	N8-1 and N8-3			

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	STEELMAN PART No.	JENSEN PART No.	WALCO PART No.	
M4	329307 (78)	† CRA-55 or ♦ CRA-55D	† W-64S or ♦ W-64D	† Jewel ♦ Diamond
	329107 (LP)	† CRA-55LP or ♦ CRA-55LPD	† W-64MGS or ♦ W-64MGD	

MISCELLANEOUS

ITEM No.	PART NAME	STEELMAN PART No.	NOTES
M5	Lamp		#47
M6	Lamp		#47
M7	Switch	370038	Stereo Tuner-Phono, SS-12, SPDT, Slide Type
M8	Switch	370043	Speaker Selector, Rotary, Wafer Type
M9	Switch	370042	Audio Range, Rotary, Wafer Type
M10	Switch	370042	Compensation, Rotary, Wafer Type

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	270154	6 Used
Cabinet	210660	Mahogany
Cabinet	210661	Limed Oak
Cabinet	210662	Walnut
Cabinet	210663	Ebony
Cabinet	210664	Fruitwood

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	6C4	
V2	AF Amp. -Phase Inv.	12AX7	
V3	Output	6BQ5/ EL84	
V4	Output	6BQ5/ EL84	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA STEELMAN PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	40	150	581004	PRS150V40	BR4015	TC48	TD-40-150	MT-1540	TVA-1413
C2	40	150	581004 ①	PRS150V40	BR4015	TC48	TD-40-150	MT-1540	TVA-1413
C3A	▲40	350	583014	AFH3-147	C1100	FP369.1	TMT-144	T-725	TVL-3758
B	■40	350							
C	▲40	150	①						
C4	100	25	581027	PRS25V100	BBR100-25	TC2501	TD-100-25	MTH-2510	TVA-1207
C5	2	50NP		NP-PRS50V2	BBR4-50 †	TT50X5 †	TD-4-50 †	MT-0504 †	R2233 *
					BBR4-50	TT50X5	TD-4-50	MT-0504	

① In some versions C2 & C3C may be interchanged.
† Connect Negative leads together.
* Not normally in distributors stock. Available thru distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA STEELMAN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C6	1000			SI1000	D6-102	LT6D2	UC-521	5HK-D1	①
C7	330			1468-00033	DD-331	5W5T33		1FM-333	②
C8	1000			BPD-001	DD-102	BYA6D1	DC521	5HK-D1	③
C9	470			1468-00047	DD-471	5W5T47		1FM-347	
C10	.003	600		P688N-003	D6-302	CUB6D3	GEM-623	6TM-D3	
C11	.02	400		P488N-02	DD-203	CUB4S2	GEM-412	4TM-S2	
C12	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C13	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C14	270			SI270	D6-271	LT6T27	UC-5327	5GA-T27	③
C15	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C16	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C17	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C18	.25	200		P288N-25		CUB2P25	GEM-2025	2TM-P25	
C19	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	

① Some versions may use 270mmf in this application.
② Not used in some versions.
③ C14 may be connected from pin 1 of V2 to chassis.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA STEELMAN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	3.25meg	½	368024					
R2A	250K	½	360265	B-50	A47-250K-S	Q11-130	U46	Loudness, Tap @ 500K Treble
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R3A	5meg	½	360330	B-88	A47-5meg-Z	Q13-141	U65	Bass
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	STEELMAN PART No.	NOTES
R4	100K			
R5	360K 5%			Note 1
R6	100K			
R7	100K			
R8	27K			Note 2
R9	8200Ω			
R10	10meg			
R11	270K			
R12	47K			
R13	10meg			
R14	47K			Note 3
R15	8200Ω	1		
R16	680Ω			
R17	270K			
R18	330K			
R19	220Ω			
R20	125Ω	5	510005	
R21	330K			
R22	220Ω			
R23	220Ω	5	510007	
R24	3900Ω			
R25	82K			
R26	150K			
R27	220K			Note 4

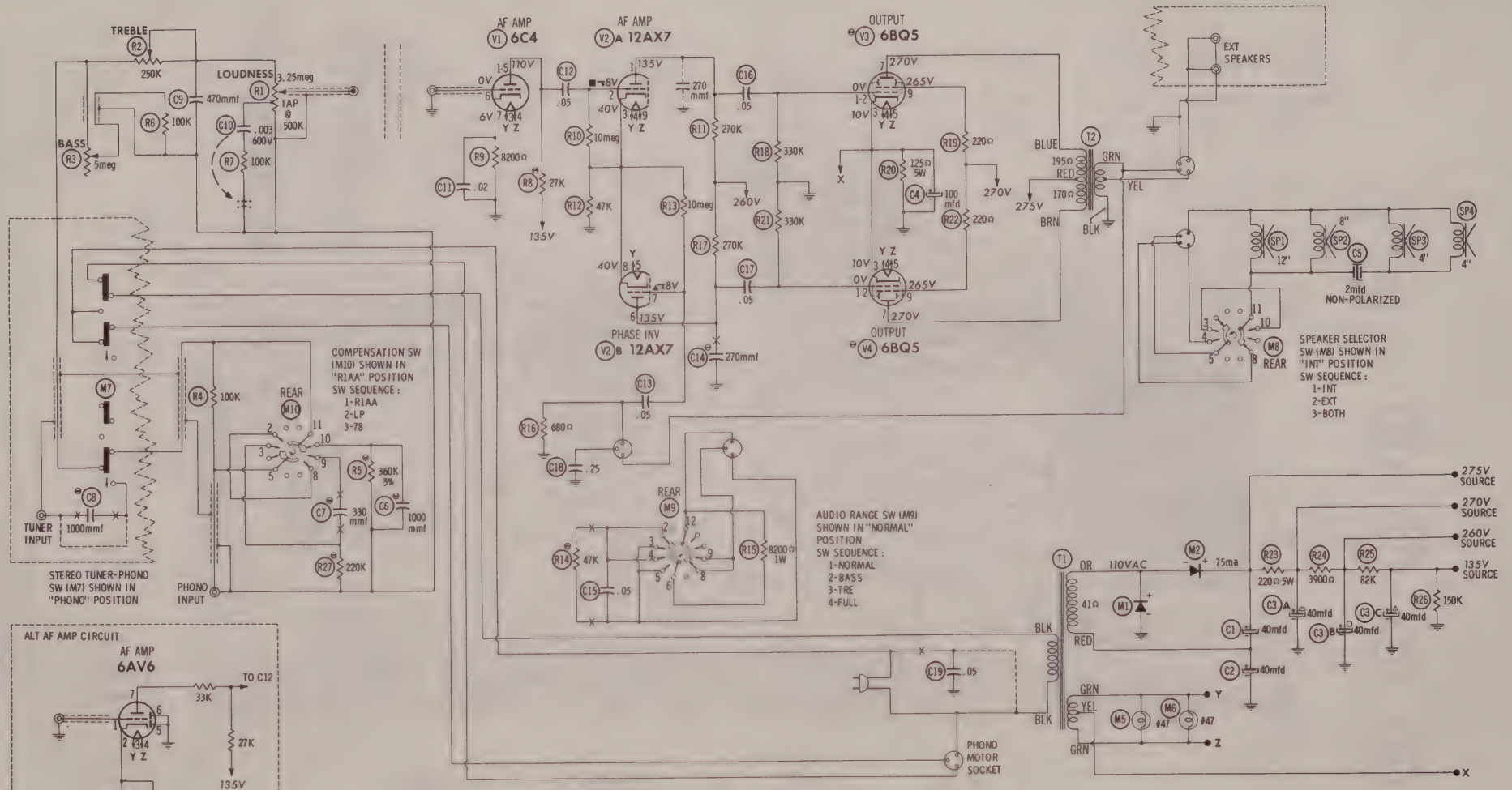
Note 1. Some versions may use 330K in this application.
Note 2. Some versions may use 82K in this application.
Note 3. Not used in some versions.
Note 4. Some versions may use 470K in this application.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA STEELMAN PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117 V @ .43A	110V @ .075A	6.3VCT @ 2A	440019						

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA STEELMAN PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	4600Ω CT	3-4Ω CT	430470	Z1011	A-2901 ①	AU-609	A-3870	24S55	S-55X	① Drill New mounting hole



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6C4	†110K	NC	125Ω	125Ω	†110K	0Ω	8200Ω		
V2	12AX7	†270K	10meg	47K	125Ω	125Ω	†270K	10meg	47K	125Ω
V3	6BQ5 EL84	330K	330K	125Ω	125Ω	125Ω	NC	†195Ω	NC	†440Ω
V4	6BQ5 EL84	330K	330K	125Ω	125Ω	125Ω	NC	†170Ω	NC	†440Ω

† MEASURED FROM OUTPUT OF M1.
▪ MEASURED FROM PIN 3 OF V2.
▲ MEASURED FROM PIN 8 OF V2.
NC NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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STEELMAN
MODEL 4A37

PHOTOFACT* Folder

SYMPHONIC MODELS 1251, 1259

SYMPHONIC MODELS 1251, 1259

MODEL 1259

SYMPHONIC MODELS 1251, 1259

TRADE NAME	Symphonic Models 1251, 1259
MANUFACTURER	Symphonic Radio & Electronics Corp., 234 Jersey Ave., New Brunswick, N. J.
TYPE SET	AC Operated Phono Amplifier With 4 Speed Automatic Record Changer
TUBES	Three
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 27 Watts, .28 Amp. @ 117 Volts AC (Less Motor)

FOR SERVICE INFORMATION ON RECORD CHANGER USED IN MODEL 1251 - SEE V-M 1200A - PHOTOFACT SET 353 FOLDER 16 OR RECORD CHANGER MANUAL RC-10
FOR SERVICE INFORMATION ON RECORD CHANGER USED IN MODEL 1259 - SEE WEBCOR 152 - PHOTOFACT SET 375 FOLDER 17 OR RECORD CHANGER MANUAL RC-10

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

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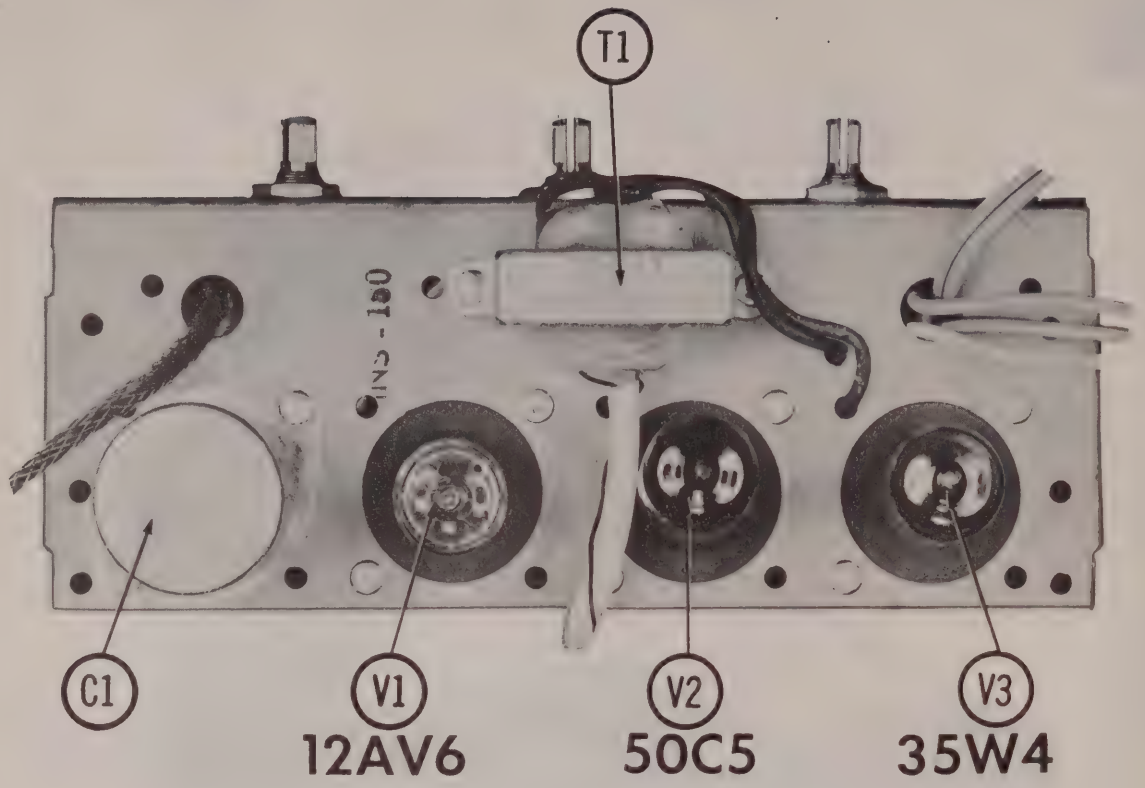
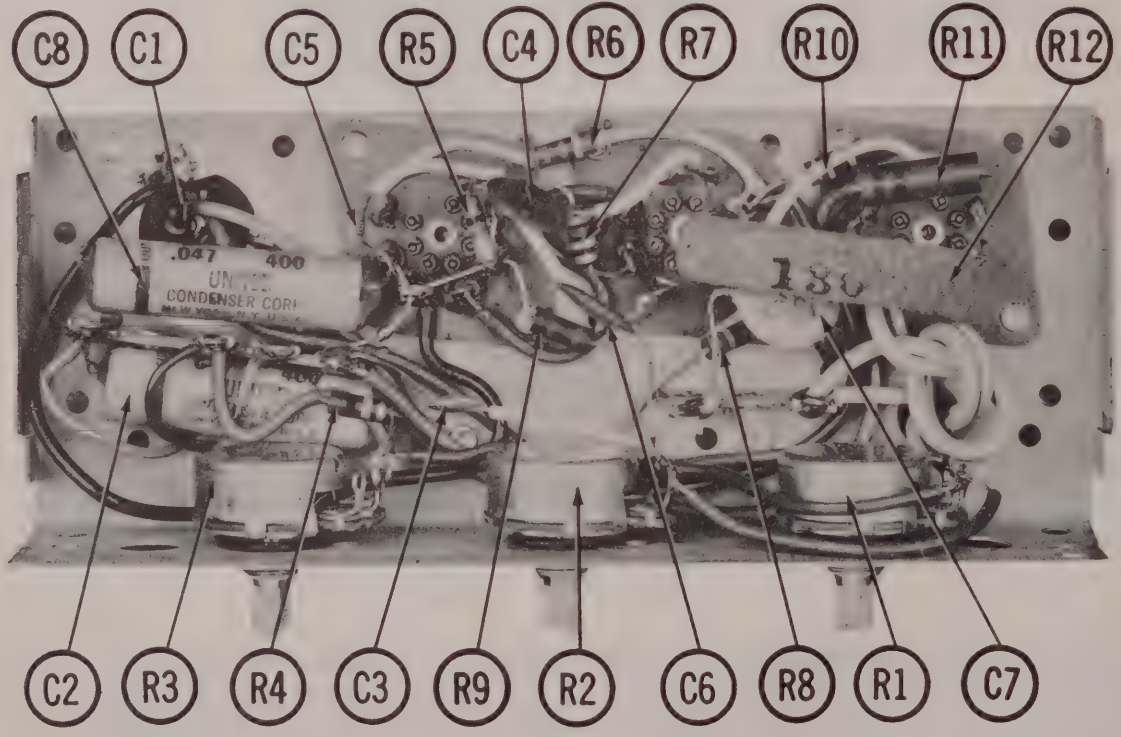
H804

SET 437 FOLDER 15



CHASSIS - TOP VIEW



CHASSIS BOTTOM VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	12AV6	
V2	Output	50C5	
V3	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	Symphonic PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	60	150	CE-101 ①	PRS150V8040	BBRT84215		TDLT-7	TMT-339	R2736 *
B	40	150		20					
C	20	150							

① Model 1259 uses 40-30-20mfd in this application (Part #CE-100)
* Not normally in distributors stock. Available through distributor on order to manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	Symphonic PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.047	400	CP-200	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C3	680		CC-101	BPD-00068	DD-681	L10T68	B-368	5GA-T68	
C4	10000		CC-100	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C5	100		CC-102	BPD-0001	DD-101	L10T1	CNO-310	5GA-T1	①
C6	10000		CC-100	BPD-01	DD-103	BYA10S1	B-110	5HK-S1	
C7	20000		CC-105	BPD-02	DD-203	BYB6S2	B-210	5HK-S2	②
C8	.047	400	CP-200	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	

① Not used in Model 1251. ② Model 1251 uses 10000mmf in this application (Part #CC-100).

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	Symphonic PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1meg	½	VC-142	B-70	A47-1meg-Z	Q13-137	U53	Volume
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R2A	500K	½	VC-116	B-59	A47-500K-S	Q11-133	U50	Treble
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R3A	3meg	½	VC-147	B-84	A47-3meg-S	Q11-140	U59	Bass, Model 1259 only
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	Symphonic PART No.	NOTES
R4	100K		RC-121	Note 1
R5	10meg		RC-117	Note 2
R6	220K		RC-113	
R7	470K		RC-118	
R8	1800Ω		RC-240	Note 1
R9	150Ω		RC-115	Note 1
R10	3900Ω		RC-119	
R11	220Ω	1	RC-403	Note 3
R12	130Ω	5(WW)	RW-103	Note 4

Note 1. Not used in Model 1251.
Note 2. Model 1251 uses 6.8meg in this application (Part #RC-103).
Note 3. Model 1251 uses 150Ω 1W in this application (Part #RC-404).
Note 4. Model 1251 uses 170Ω 5W in this application (Part #RW-102).

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	Symphonic PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2600Ω	1-2Ω	TR-117 ① TR-118 ②	Z1001 ③				24S48		

① Used in Model 1259. ② Used in Model 1251. ③ Drill new mounting hole.

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	Symphonic PART No.	QUAM PART No.	NOTES
SP1	5"	PM	3-4Ω	SP-603 ①	5A1R	① Used in Model 1259, Parallel and Phase
SP2	5"	PM	3-4Ω	SP-603 ①	5A1R	
	4"	PM		SP-401 ②		② Used in Model 1251, Parallel and Phase
	4"	PM		SP-401 ②		

PHONO CARTRIDGE

ITEM No.	Symphonic PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	JENSEN PART No. CARTRIDGE	JENSEN PART No. NEEDLE	REMARKS
M1		312-TS	N8-1 & N8-3			

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	Symphonic PART No.	JENSEN PART No.	WALCO PART No.	REMARKS
M2	(78)	† CRA-55 or ♦ CRA-55D	† W-64S or ♦ W-64D	† Jewel ♦ Diamond
	(LP)	† CRA-55LP or ♦ CRA-55LPD	† W-64MGS or ♦ W-64MGD	

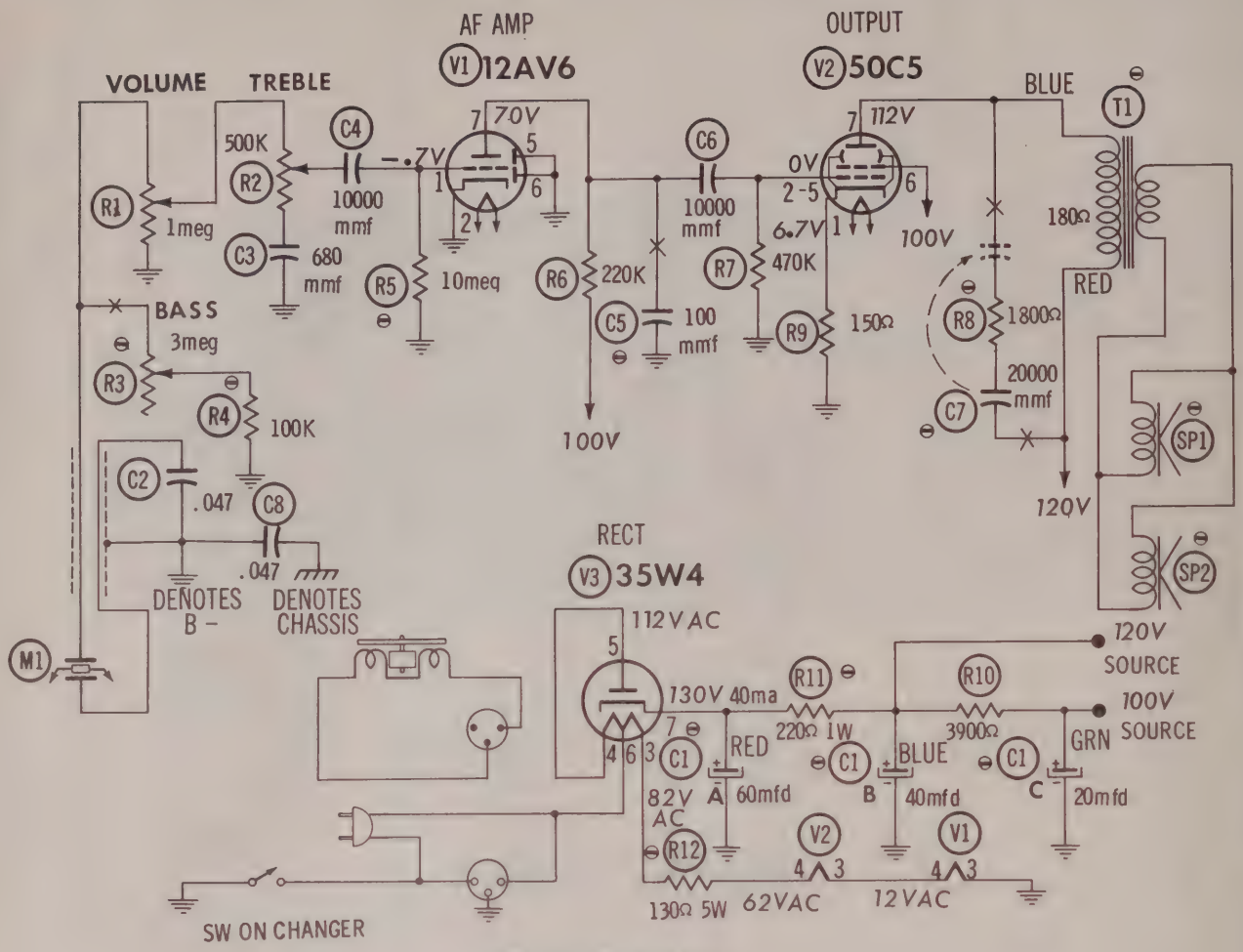
CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	KN-154	Bass, Model 1259
Knob	KN-155	Treble, Model 1259
Knob	KN-156	Volume, Model 1259
Knob	KN-208	Volume, Model 1251
Knob	KN-209	Tone, Model 1251

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12AV6	10meg	0Ω	0Ω	12Ω	0Ω	0Ω	†220K
V2	50C5	150Ω	470K	12Ω	62Ω	470K	†4100Ω	†400Ω
V3	35W4	TP	NC	190Ω	225Ω	225Ω	215Ω	¶

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
† MEASURED FROM PIN 7 OF V3.
NC NO CONNECTION
TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

⊖ **SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION**

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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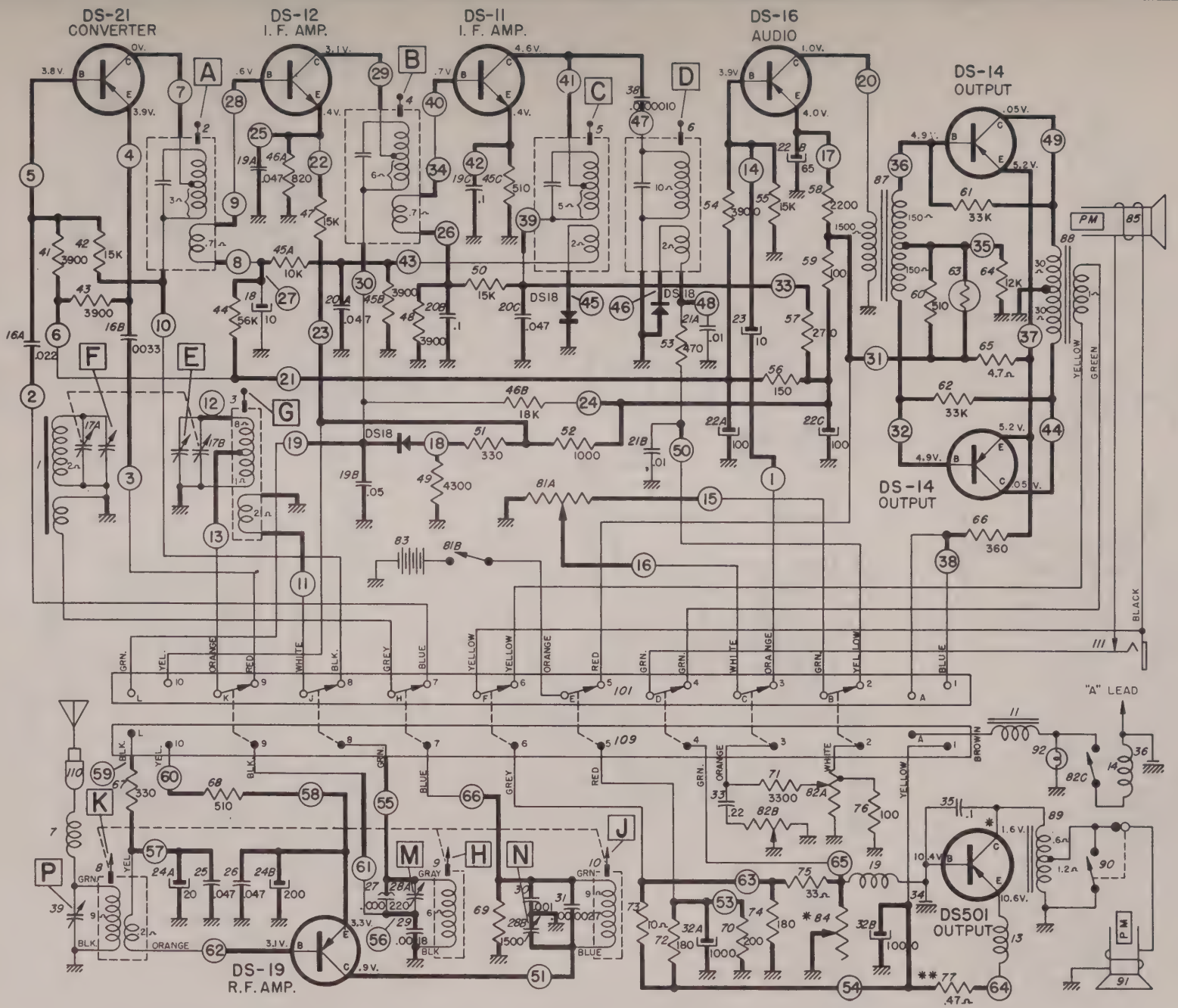
SYMPHONIC MODELS 1251, 1259

BUICK MODEL 981970

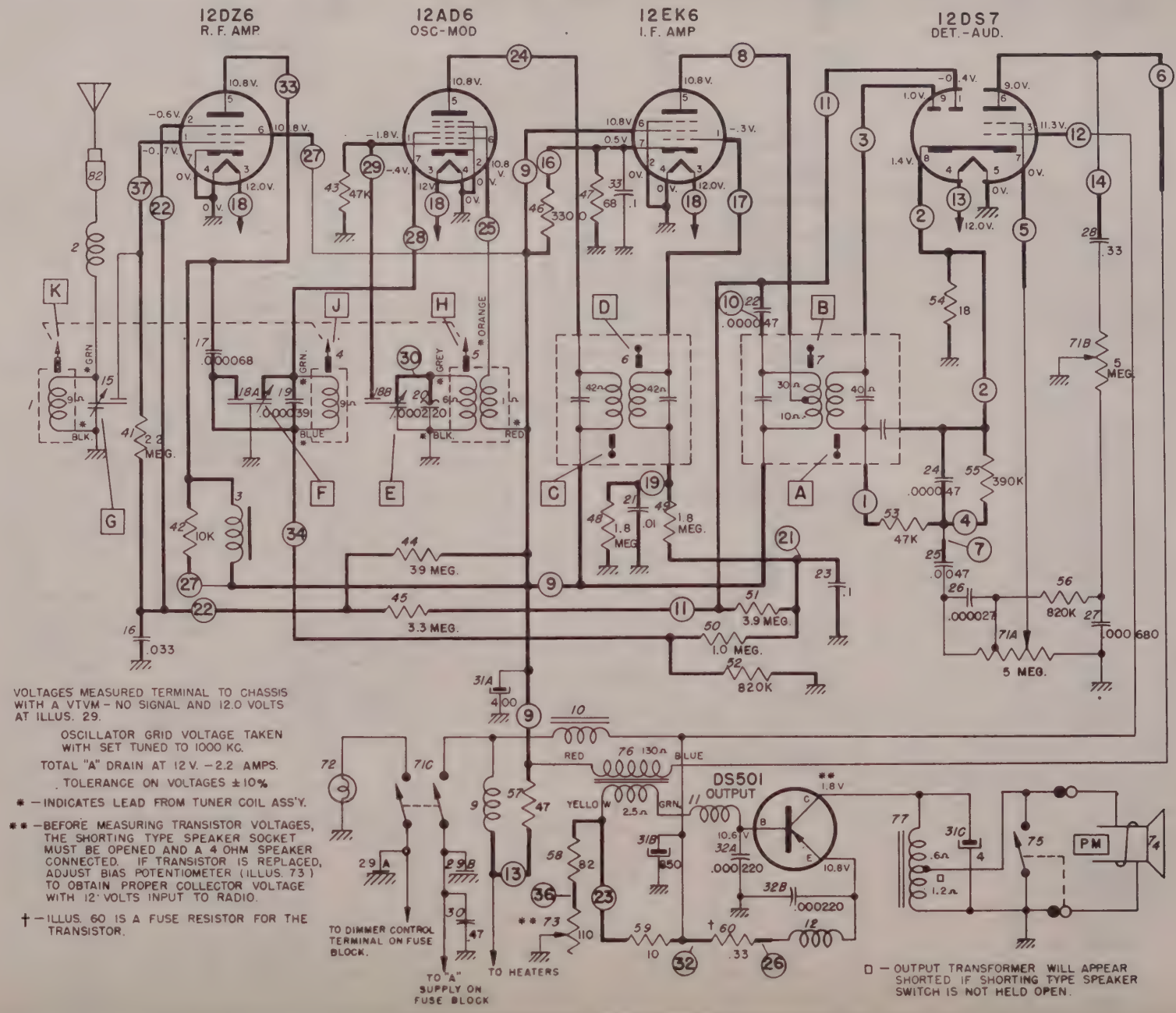


PRINTED CIRCUIT IN HEAVY LINES

Schematic Diagrams Courtesy of DELCO RADIO DIV. GENERAL MOTORS CORP.

CHEVROLET MODEL 987891

PRINTED CIRCUIT IN HEAVY LINES



VOLTAGES MEASURED TERMINAL TO CHASSIS WITH A VTVM – NO SIGNAL AND 12.0 VOLTS AT ILLUS. 29.

OSCILLATOR GRID VOLTAGE TAKEN WITH SET TUNED TO 1000 KC.

TOTAL "A" DRAIN AT 12 V. – 2.2 AMPS.

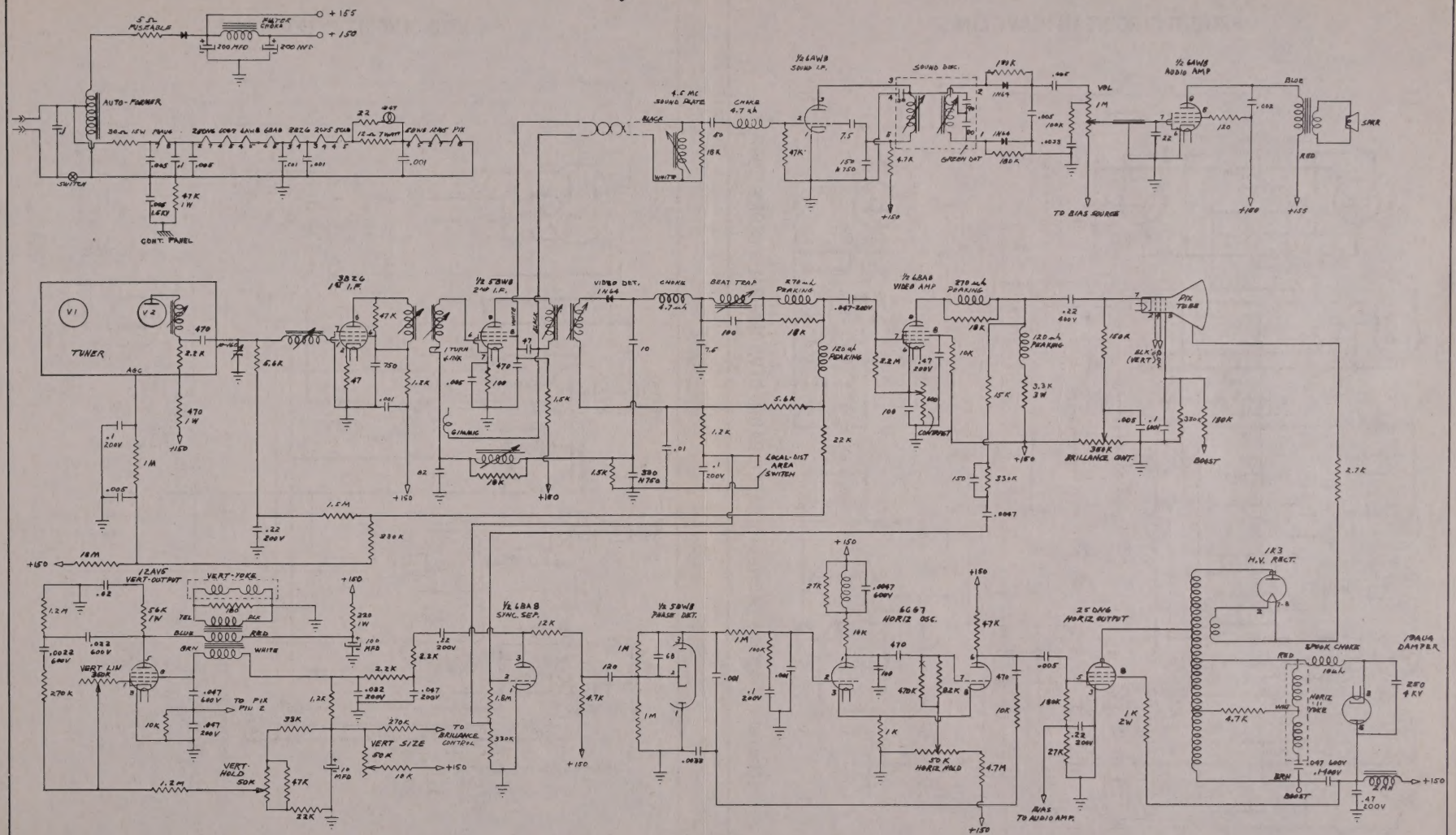
TOLERANCE ON VOLTAGES ± 10%

* – INDICATES LEAD FROM TUNER COIL ASS'Y.

** – BEFORE MEASURING TRANSISTOR VOLTAGES, THE SHORTING TYPE SPEAKER SOCKET MUST BE OPENED AND A 4 OHM SPEAKER CONNECTED. IF TRANSISTOR IS REPLACED, ADJUST BIAS POTENTIOMETER (ILLUS. 73) TO OBTAIN PROPER COLLECTOR VOLTAGE WITH 12 VOLTS INPUT TO RADIO.

† – ILLUS. 60 IS A FUSE RESISTOR FOR THE TRANSISTOR.

D – OUTPUT TRANSFORMER WILL APPEAR SHORTED IF SHORTING TYPE SPEAKER SWITCH IS NOT HELD OPEN.



MUNTZ MODELS 21CB, 21CM, 21LBB,
21LBM, 21TB, 21TM, 24CB, 24CM,
24TB, 24TM (Ch. "J"

SCHEMATIC DIAGRAM COURTESY OF MUNTZ TV INC.

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